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The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT

Volume IX JANUARY, 1909 Number 97

Photography with Small Cameras

To the unobservant eye, "Photography with Small Cameras" may look like an every-day title for a photographic disquisition of the dry-as-dust sort. As a matter of fact, the phrase here covers the most interesting movement in photography since the advent of the anastigmat. In a word, this movement is the widespread introduction of very small cameras of high efficiency. Its significance, however, is not perceived until one has taken account of many things generally overlooked; which is excuse sufficient for the discussion of the small hand-camera and its advantages in what is, first and last, a magazine of photographic information. Here, then, is the field of our adventure.

Our love of the diminutive is instinctive. Witness the interest and attraction of the working model exhibited in a shop window, to draw the passerby. Equally strong is the common aversion to personal encumbrance—the carrying of a parcel, bag or umbrella in every-day life. Both arguments apply to the small hand-camera. If it will do its work, the smaller it is the better we like it, and the more it will be used. In Europe, where life itself is compact and more closely knit than with us, the advantages of the small camera are well understood, and the 3¼ x 4¼-inch size, or its continental equivalent, has always been the most popular size outside of the purely professional and commer-

cial uses. Latterly everything has tended to a further reduction of size and bulk as factors in photography, and so today we have an increasing desire for cameras even smaller than 3¼ x 4¼ inches.

Small Cameras Practical

We have had small hand-cameras for years. Their practicability for certain well-defined classes of work has been amply demonstrated. It is fairly well known, for example, that much of the work of such men as Steichen, Stieglitz and Coburn is done with small hand-cameras and afterward enlarged for exhibition. The remarkable photographs of Indian life exhibited by Mr. Frederick T. Monsen during the past few years—all made with a Folding Pocket Kodak—offer further proof that the small camera will produce good work when properly handled. Why, then, should the exploiting of more small cameras be invested with special significance. Briefly: because of the notable advances evident in the small cameras of today as compared with those of yesteryear; and, again, because we have not as yet, in America at least, given the small camera the serious attention it deserves. As we will see, the small camera of today is, in sober fact, the climax to that wonderful simplification of photography which we have watched with so much interest for some years past, and brings to a practical focus all the advances of the last quarter of a century.

To appreciate these advances, and to draw out the possibilities opened up by the small hand-cameras of today, we must first know something about the points of efficiency in cameras from the practical viewpoint of results. Here we are bound to consider technical details, but their interest will compensate for their dryness.

Efficiency Points

The practical usefulness of a hand-camera—the actual range of its capacity—is most largely determined by the quality of its optical equipment—lens and shutter. The efficiency of a lens depends upon its light-gathering capacity (speed), and its ability to give a perfectly defined image over the whole of its field (definition). These qualities are combined in the highest degree in the modern anastigmat. Again, for many everyday subjects and conditions, we need a shutter capable of giving

exposures as short as 1-100 to 1-500 of a second. This means either a focal-plane or lens shutter of fine and accurate adjustment. The fitting of such an optical equipment to a small camera necessitates in the latter the best of workmanship as far as construction is concerned. Unless we have absolute rigidity and parallelism of back and front when the camera is extended in use, together with accuracy and smoothness of working parts, the high efficiency of lens and shutter will avail us nothing. As a matter of fact, much of the blurred definition and lack of crispness seen in our hand-camera work of today, even where high-grade lenses are employed, is due to deficiencies or defects in camera construction. With all this, for general use, the camera must be practically without bulk or weight, compact almost to the vanishing point when closed, and yet instantly adjustable, ready for use, when required. This is a formidable list of requirements. It is obvious that they could not be provided, on the score of price alone, in the small cameras of yesterday. We have them all in those of today, and the wider range of capacity they give us is worth the added cost.

Basic Facts

Let us look at the bottom facts. The possibility of making a photograph of any object with a hand-camera depends wholly upon our ability to give an exposure sufficient to get a developable image on the plate or film before there is movement either in the subject or of the camera. This is worth re-reading. On the one hand, the subject itself may include more or less movement; on the other hand, it is hardly possible to hold the camera perfectly still in the hands longer than 1-10 of a second. These facts explain why photography with the small hand-cameras of yesterday was so prolific in disappointments and was hedged about with so many limitations. The small cameras of the past lacked lens efficiency (light gathering capacity or speed). The subject had to be well illuminated, and fairly distant from the camera: the conditions had to be favorable, i. e., we had to photograph on bright days, between the hours of ten and two. Within these limits success was fairly certain with ordinary care and with subjects not including rapid move-

ment. Outside of these favorable conditions—on dull days, with difficult subjects—the limitations of our apparatus interfered with success and the percentage of failures became discouraging.

The Question Answered

At this point, the modern small camera, with its high efficiency, marks the long-desired advance. If photography is ever to become universal in application and have a wider usefulness than a summer pastime, we must be independent of light conditions, time of year or day, character, color, distance and illumination of subject, and all other limitations. This freedom, expressed practically in the question, Can I photograph this or that here and now? is really determined by the speed of the lens and shutter. If the lens (and shutter) will admit to the plate or film, during the period of time allowable for the exposure, sufficient light to give a developable image of the object photographed, then we can secure the desired record regardless of other conditions. Lacking this power or capacity in the lens, we must either lose the record, or wait until we have such a combination of subject and conditions as will permit the exposure required by the limitations of our optical equipment. Here we see why the anastigmat lens is so universally desirable. Its speed alone overcomes so many of the common difficulties and limitations; its efficiency has widened the range of everyday photography a hundredfold. In the small hand-cameras of 1909, we have the power and capacity of the anastigmat made available under the most favorable conditions.

The Speed of a Lens

The rapidity or speed of a lens is usually expressed by a figure which shows the relationship in size between its largest exposure opening or aperture and the focal length of the lens. Thus a lens of four inches focal length which has an aperture of one inch, is commonly described as having a speed or rapidity of *f* 4, i. e., as constructed to work with an aperture equal to one-fourth of its focal length. The larger the aperture in proportion to its focal length, the greater is the light-gathering capacity or speed of the lens. Since large apertures combined with defining power involve the use of special qualities of glass, care-

ful construction, with delicate correction and adjustment, so speed in lenses involves a high price.

Comparing Lenses for Speed

In practice all lenses are fitted with a series of apertures ("stops" or diaphragms), so arranged that, beginning with the largest in area, each succeeding (smaller) aperture admits one-half the volume of light admitted by the preceding (larger) aperture in any given period of time. It follows that, with such a series, the exposure required with any given aperture or "stop" is one-half that required with the next following (smaller) aperture, or double that required by the next preceding (larger) aperture. Apart, then, from the real purpose of diaphragms or apertures, which need not concern us here, this common arrangement of apertures in lenses affords a guide to the variation in exposure required by variation in the aperture used. What is more to the point here, this knowledge gives us a ready means of comparing the relative speed efficiency of different lenses, and so enables us to "size up" at a glance the practical range of capacity possessed by any apparatus listed in a catalogue or shown for sale by the dealer.

For Example

To make this important point quite plain to the beginner, let us suppose that we have purchased a lens said to have a speed of *f* 4. The apertures or "stops" will usually be marked on the tube or shutter face as follows: *f* 4, *f* 5.6, *f* 8, *f* 11, *f* 16, *f* 22, *f* 32, *f* 45, or, if the manufacturer employs the U. S. (uniform system), as is the case with kodak lenses, then the apertures will be marked in U. S. numbers as follows: 1, 2, 4, 8, 16, 32, 64, 128. Recalling what we have learned above about the relative exposures required with different apertures, let us put the two systems of numbering together, with the exposures required under each aperture:

f-values . . .	*f* 4	*f* 5.6	*f* 8	*f* 11	*f* 16	*f* 22	*f* 32	*f* 45
U. S. Nos. . . .	1	2	4	8	16	32	64	128
Exposure or Speed Ratio . .	1	2	4	8	16	32	64	128

With lenses which are not numbered, as to diaphragm openings, on either the *f* value or the uniform system, the ratios are slightly different.

Practical Results

From this comparison of apertures and speed ratios we see that, under equal conditions, a lens with an aperture of *f* 4 (No. 1) passes to the plate in a given period four times as much light as a lens whose largest aperture is *f* 8 (No. 4); or eight times as much light as another lens whose largest aperture is *f* 11 (No. 8); or sixteen times as much light as a lens whose largest aperture is *f* 16 (No. 16). When we recall the many failures we have experienced in photographing subjects including movement, in at-home portraiture, or when working on dull days or under difficult conditions of light or subject (almost all such failures really arising from insufficient exposure), we see at once that with a lens working at *f* 4 we can attempt many subjects, disregard many limitations, and succeed under all sorts of conditions, which would be impossible with a lens whose largest aperture is *f* 8, or *f* 11, or it may be *f* 16.

Today's Advance

If we apply this to the subject in hand, the enormous capacity of today's small cameras over those of past years will be evident at a glance. Until very recently our small hand-cameras were fitted with simple meniscus or achromatic lenses working at *f* 16, or with rectilinears having *f* 8 as their largest aperture. Under favorable conditions and within a well-defined range of work, these apertures will meet ordinary requirements. But when we come to serious record work, such as that required by scientists, botanists, surveyors, artists, engineers, or need the ability to make photographs in all sorts of weather and regardless of local conditions of time or place, then these small apertures impose too many restrictions and involve too many chances of failure. Here we need light-gathering capacity or speed—the reserve power of the anastigmat with its large apertures and perfect definition. It is here that the small hand camera of 1909, fitted with anastigmats at *f* 4, *f* 5.6 and *f* 6.8 opens up so many new possibilities.

Better Definition

Apart from the advantages resulting from the speed of anastigmats fitted to small cameras, there is a further gain in the superb definition and greater brilliancy of image

Reproduced, same size as originals, from photographs made with the No. 1 Folding Pocket Kodak

Original and enlargement from a pocket camera negative

given by anastigmats as compared with the meniscus or average rapid rectilinear. This is an important point where small pictures are concerned, whether for record only or after enlargement, wherein we naturally look for critical sharpness and complete absence of blur. Thus there is no comparison between an enlargement from a small negative made with an anastigmat carefully focused, and another enlargement of the same subject from a negative made with the meniscus or rectilinear lens fitted to the average hand-camera.

Depth of Definition

Another point of interest deserves mention before we leave the question of lens efficiency. Those who have used anastigmats with large apertures in order to gain speed, and know how these lenses lack in depth of definition (often spoken of as depth of focus or depth of field), may be surprised to learn that this difficulty practically disappears in the use of anastigmats of short focal length, such as are necessarily employed with very small hand-cameras. The explanation is simple, but is based on a fact generally forgotten or overlooked. The depth of definition available with any given aperture increases as the focal length of the lens diminishes. In other words, the shorter the focal length of the lens, the greater is the depth of definition available with any given aperture or "stop." Thus a four-inch lens working at $f/4$ gives greater apparent depth of definition than an eight-inch lens working at the same aperture. For example: if we focus on an object fifteen feet distant from the camera with a four-inch lens at $f/4$, all objects situated between ten and twenty-seven feet away from the camera will be fairly sharp in definition; whereas, if we focus on the same object at the same distance with an eight-inch lens at $f/4$, only those objects situated between thirteen and seventeen feet away from the camera will be sharply defined. In the case of the four-inch lens, the depth of definition (or apparent depth of field) is seventeen feet; in the case of the eight-inch lens with the same aperture, the depth of definition is only four feet. The advantage is obvious. In hand camera work we most often need this depth of field to get a satisfactory record of the scene.

Exposure Shutters

The equipment of the small camera with lenses of large aperture not only enables us to get successful negatives under conditions beyond the range of the small cameras of yesterday. It also opens up wider possibilities in the photography of subjects including rapid movement. But for this latter class of work the rapid lens alone is not sufficient. We must have an exposure shutter which, by its capacity and range of movements, will make the increased lens efficiency available for use. In keeping with this, the small cameras of 1909 are fitted with exposure shutters of improved form and added capacity. Some of the new models, both of the folding and reflecting types, are provided with focal-plane shutters with speeds ranging from 1-10 to 1-1000 of a second. Other models, aiming at extreme compactness, are fitted with lens shutters of special design, giving exposures up to 1-250 of a second. For 75 per cent of our possible subjects the last-mentioned type of shutter will meet all requirements; but where much speed work is to be attempted, or where we may need the utmost light efficiency possessed by the lens in use, the focal-plane shutter will doubtless be preferred. Latterly, since lens shutters have been so much improved, the higher efficiency of the focal-plane type has been questioned. On this point a careful reading of THE PHOTO-MINIATURE No. 77 is advised. Practically, we may say that, with any shutter capable of giving exposures of 1-250 of a second, the capacity of the hand-camera is quadrupled. When it is recalled that, in the case of the small hand-camera of today, such shutters are fitted to lenses of large aperture and short focal length, the advance in actual efficiency here accomplished will be plain to all who have had experience in what is commonly known as "speed work."

Camera Construction

Of the improvement in mechanical construction and adjustment visible in today's small cameras there is little need to speak in detail. It was necessitated by the high-grade optical equipments which are the distinctive feature of these cameras. The looseness and inaccuracy of movement, the slight tilt or lack of parallelism between front

and back, and other small defects which are of little importance in cameras fitted with lenses whose largest apertures are *f* 11 or *f* 16, would prove fatal to success in an instrument equipped with an anastigmat.

Bulk Coming at last to the detail of bulk, we have here a special feature of the small cameras of today, which is bound to bring about a big increase in the use and popularity of photography. Not only have we extreme compactness in form, absence of projecting parts, and a readiness of adjustment hitherto unknown; but we have also a long-deferred recognition of the fact that availability of use in the camera is of more importance than the size of the record obtained. It is passing strange that this detail has been so persistently neglected by American and British manufacturers. At all events, the small cameras of today are really small, so that we are at last in line with the more progressive continental workers. The advantages gained are many, but the increased availability for use overtops them all. So long as we cling to the 4 x 5- or 5 x 7-inch camera as the minimum in picture size, the carrying of a camera, whether for pleasure or serious use, is bound to involve an amount of trouble and inconvenience sufficient to restrict the use of photography. If, however, we can make use of photography as a means of record without a thought of encumbrance, the camera fitting a convenient pocket and not demanding consideration as a thing separate and apart, then there can be little question but that photography will quickly find universal application in all the arts of life. The pocket camera of today meets all these requirements and gives us the desired capacity.

The Market With this preliminary acquaintance with the small camera in theory, we can now intelligently consider the cameras already available in the market. In this survey, we will confine our view to cameras readily obtainable in America and Great Britain, and to instruments using plates or film smaller than quarter-plate size, i. e., 3 ¼ x 4 ¼ inches. Roughly, we may divide them into two classes, according to their equipment and capacity.

Cameras for Beginners

In the first class we put the small cameras made for beginners, reasonably compact, simple in construction and manipulation. Such cameras are usually fitted with simple meniscus or achromatic lenses working at *f* 11 or *f* 16, or with rectilinears working at *f* 8, with exposure shutters variously marked as to speeds, but possessing perhaps a maximum speed capacity of 1-40 or 1-50 of a second. Their outstanding points are simplicity and efficiency at a moderate price. For the beginner, for occasional use under favorable conditions and for a limited range of subjects, they produce thoroughly good results. For example, see the two pictures facing page 8, made with the No. 1 Folding Pocket Kodak. This little camera, one of the best of its class, will go into the average coat pocket, measures 6¾ x 3½ x 1⅝ inches, weighs only 16 ounces; carries a twelve-exposure roll-film for pictures 2¼ x 3¼ inches; is so simple in manipulation that a boy or girl of 10 years can use it with success; and sells at $10.

For Serious Workers

In the second class we put the new small cameras of 1908–9, obviously intended for serious work demanding capacity and a wide range of efficiency. These instruments are distinguished by extreme compactness and fineness of construction, but are fitted with all the various movements and adjustments found in the larger high-grade cameras. Their optical equipment usually consists of an anastigmat working at *f* 4.5, *f* 5.6, or *f* 6.3, with focal plane or lens shutters.

A Tabular List

As it is impossible to attempt even a brief description of the innumerable varieties of models to be found in these two classes, I give here a tabular list of some few of them, mentioning their principal features. Complete specifications covering each camera can, of course, be found by reference to the makers' catalogues. Following this list, a few of the latest introductions will be described at greater length, as showing how closely the ideal small camera is approached in commercial form. It is in these especially that we see the marked advances mentioned under capacity and equipment.

Some American and British Cameras for Pictures Less Than 3¼ x 4¼ Inches

Abbreviations: A = American. B = British. A B. = In both markets. Men. = Meniscus Lens. Achro. = Achromatic. R. R. = Rapid Rectilinear

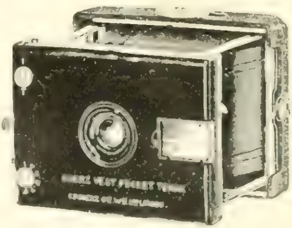
Camera	Picture size	Plates or films	Dimensions	Weight	Lens	Shutter	Market
	Inches						
1 Folding Buster Brown	2¼ x 3¼	Roll film	3½ x 6¼ x 1¾	14 ozs.	Men.	T. and I.	A.
Ansco Junior	2¼ x 4¼	Roll film	2 x 8¼ x 4¼	21 ozs.	R. R.	T. B. and I.	A.
1A Folding Hawk-eye	2½ x 4¼	Blair film	1¾ x 4 x 7¾	24 ozs.	Achro. or R. R.	Pneumatic release	A.
1 Blocknote	2 5/16 x 1¾	Plates	3½ x 2½ x 1	10 ozs.	R. R. or Anastig.	Guillotine type	A. B.
2 Blocknote	2½ x 3½	Plates	3½ x 4½ x 1½	......	Anastigmat	Guillotine type	A. B.
1 Premoette	2¼ x 3¼	Film pack	1⅛ x 3 5/16 x 4½	11 ozs.	Men.	T. B. and I.	A. B.
1A Premoette	2½ x 4¼	Film pack	2¼ x 3⅝ x 5½	16 ozs.	Men.	T. B. and I.	A. B.
1 Premoette Special	2¼ x 3¼	Film pack	2¼ x 3¼ x 4¼	11 ozs.	R. R. or Anastig.	Auto or compound	A. B.
1A Premoette Special	2½ x 4¼	Film pack	2¼ x 3⅝ x 5½	16 ozs.	R. R. or Anastig.	Auto. or compound	A. B.
1A Speed Kodak	2½ x 4¼	Roll film	2¼ x 4½ x 9¼	3 lbs.	Anastigmat	Focal plane	A. B.
1 F. P. Kodak	2¼ x 3¼	Roll film	1⅝ x 3½ x 6¼	16 ozs.	Men. Achro.	Automatic	A. B.
1A F. P. Kodak	2½ x 4¼	Roll film	1¼ x 3⅝ x 7¼	20 ozs.	Men. Achro.	Automatic	A. B.
1A F. P. Kodak Special	2½ x 4¼	Roll film	3¼ x 2 x 8	23 ozs.	R. R. or Anastig.	Automatic	A. B.
2 F. P. Kodak	3½ x 3½	Roll film	1½ x 4½ x 6¼	18 ozs.	R. R.	F. P. K. Automatic	A. B.
2 F. P. Brownie	2¼ x 3¼	Roll film	2¼ x 3⅝ x 6⅝	16 ozs.	Men.	P. Anchromatic	A. B.
Ensignette	1½ x 2¼	Roll film	¾ x 1⅜ x 3⅝	......	Men. Achro.	Everset T. B. I.	B.
Expo	⅝ x ⅞	Roll film	Size of a watch	3 ozs.	Men. Achro.	T. I.	A.
Ticka	⅝ x ⅞	Roll film	Size of a watch	3 ozs.	Men. Achro.	T. I.	B.
Focal Plane Expo	⅝ x ⅞	Roll film	Size of a watch	5 ozs.	Anastigmat	Focal plane	A.
Focal Plane Ticka	⅝ x ⅞	Roll film	Size of a watch	5 ozs.	Anastigmat	Focal plane	B.
Vest Pocket Tenax	1¾ x 2 5/16	Plates	1 x 2¼ x 3½	11 ozs.	Anastigmat	Guillotine type	A. B.
Bijou Reflex	1¾ x 2⅜	Plates: Flat films	4 x 3½ x 4 5/16	......	Anastigmat	Focal plane	A. B.
Voigtlander Reflex	2½ x 3½	Plates: Flat films	5¼ x 5¼ x 6 5/16	......	Anastigmat	Focal plane	A. B.
Graflex, 1A	2½ x 4¼	Roll film	3 x 5¼ x 9½	3½ lbs.	Anastigmat	Focal plane	A. B.
Graphic, O	1⅝ x 2½	Roll film	3¼ x 3½ x 5	23 ozs.	Anastigmat	Focal plane	A. B.
Dainty Soho Reflex	2½ x 3½	Plates: Flat films	5 x 5 x 5½	......	Anastigmat	Focal plane	B.
Vesta	2½ x 3½	Plates: Films	1⅝ x 3⅝ x 4¾	14 ozs.	Anastigmat	Lens-to 1-250 sec.	B.
Sibyl	2½ x 3½	Plates: Flat films	1 5/16 x 3⅝ x 5	......	Anastigmat	Pneumatic	B.
Kibitz	2½ x 3½	Plates: Flat films	1¼ x 3 x 4½	15½ ozs.	Anastigmat	Compound	B.
Ross F. P. Reflex	2½ x 3½	Plates: Flat films	5 x 5 x 5	2½ lbs.	Anastigmat	Focal plane	B.
Minimum Palmos	2½ x 3½	Plates: Flat films	... ...	......	Anastigmat	Focal plane	B.

Focal Plane Expo

Beginning with the smallest of pocket cameras, we have this year the Focal-Plane Expo (Expo Camera Co., New York), which in size and appearance is exactly like the ordinary Expo, but is fitted with a Cooke anastigmat working at *f* 5.6, and a focal-plane shutter of special design, with five speeds up to 1-400 second. This camera, which in Britain is known as the Ticka, is wholly made of metal, resembling a silver watch in size and appearance; it carries daylight loading roll-film for twenty-five exposures, and gives negatives ⅝ x ⅞ inch, which can readily be enlarged to 2 x 3 inches with the Expo enlarger (an ingenious printing box which makes enlarging as simple as the making of a print). Since its introduction in 1907, the Expo watch camera has abundantly proved its capacity for practical work, and now that it is available with an improved optical equipment it will undoubtedly win still larger favor by its wider capacity. An example of the work of the ordinary Expo (original and enlargement) is given on page 17.

Vest-Pocket Tenax

The name here gives us an indication of the size of this camera (Goerz American Optical Company, New York and London) which, when closed, measures only 3½ x 2¾ x 1 inch, is perfectly flat without projection, and weighs eleven ounces. It is fitted with a Goerz-Dagor lens of 3 inch focal length, with apertures *f* 6.8, *f* 11, *f* 22, and a guillotine shutter adjusted to give accurate exposures of ½, 1-10, 1-25, 1-75 and 1-100 of a second. Time and instantaneous exposures are separately provided for. The V. P. Tenax uses plates or flat film 1¾ x 2 5/16 inches, six single metal plate holders



accompanying the camera. The finder is of the direct vision type and is sighted through a magnifying sight placed at the back of the camera. This finder is recessed in the camera front. When pulled out, it projects beyond

Original and enlargement made with an
Expo Watch Camera

the camera ready for use, uncovering the lens at the same time. When not in use, it is slid back into its bed, thus protecting the lens from dust or injury. A brilliant box finder can also be fitted for use when the camera is held at the waist level. When opened, the camera is automatically set at sharp focus for all objects at and beyond the infinity distance—about thirteen feet; but a focusing dial is also provided by the use of which all objects distant from twelve feet to infinity are automatically focused, this obviating the difficulty of estimating distances. For objects very close to the camera, a focusing screen is provided, enabling one to focus a full-length figure at nine feet distance. For small objects, such as flowers, requiring to be photographed at a distance of a few inches away, supplementary lenses are furnished. Provision is also made for the use of the V. P. Tenax on an ordinary tripod.

To complete the equipment and facilitate the enlarging of these small negatives, the manufacturers of the V. P. Tenax also offer the V. P. T. Automatic Enlarger, which employs the V. P. Tenax and its lens, being scaled for enlargements to 3¼ x 4¼ inches, 3½ x 5½ inches (post card) and 5 x 7 inches. The enlargements we have seen made with this apparatus are remarkably fine in quality throughout.

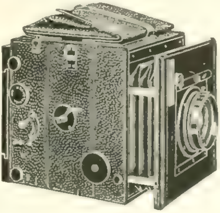
Bijou Reflex

The Bijou Reflex camera (Voigtländer and Sohn, New York and London), is said to be the smallest reflecting camera made. It takes plates or flat films 1¾ x 2⅜ inches, and measures, when closed, 4 x 3½ x 4 5-16 inches. Wholly constructed of metal, covered with fine leather, fitted with a 4-inch Heliar lens *f*/4.5, in a focusing mount, a focal-plane shutter of the two-slit pattern for time and instantaneous exposures from 1-12 to 1-1000 of a second, revolving back and rising front, and provided with a changing plate magazine carrying twelve plates or flat films, it certainly is an attractive example of compactness and efficiency combined. In practice, it has been demonstrated that the small negatives made

with the Bijou Reflex can be enlarged to 16 x 20 inches without loss of pleasing sharpness in the picture. A telephoto attachment, giving a magnification of two and one-half times, is also available for this camera, which still further increases the ranges of its possibilities. The speed of this telephoto attachment is ample for snapshots in a good light.

Voigtländer Reflex

This model, also made by Voigtländer and Sohn, differs in slight details from the above. Its dimensions are 5¼ x 5¼ x 6 5-16 inches and it take plates or flat films 2½ x 3½ inches. This model has a rack and pinion focusing movement and square bellows; a smooth and absolutely silent focal-plane shutter release; ample rising front movement and a revolving back. It may be had in several sizes besides that mentioned, and in the larger sizes may be fitted for film-pack and roll-films as well as plates.



The big feature of all reflex cameras, of course, is the reflecting mirror with focusing hood. This greatly facilitates composition and the correct placing of the subject on the plate, and enables one to see or follow the image, full size, up to the moment of exposure.

Graflex 1A

This is a new model in the graflex series (Folmer and Schwing division, Rochester, N. Y.), for negatives 2¼ x 4¼ inches, using 1A kodak film. Its outside dimensions are 3 x 5¼ x 9½ inches; weight 3½ pounds. In general appearance this camera resembles the 3A kodak, with rounded ends and folding focusing hood, mirror, etc.

In construction it embodies the general feature of the popular 3A Graflex of last year, in which the mirror and bellows frame recede, giving extreme compactness. The folding base is fitted with rack and pinion focusing movement, permitting the lens to be racked out beyond the edge of the base, this providing an extension capacity unusual in so compact a camera. The design of the lens support and spring-actuated, parallel-movement guides ensures absolute rigidity and perfect parallelism between film and lens, which is essential in cameras equipped as this is with such anastigmats as the Cooke, Series II, f 4.5 and the Zeiss Tessar 1C, f 4.5. The camera is fitted with a focal-plane shutter, with speeds 1-10 to 1-1000 second and time exposures. A special safety device prevents the shutter being set while the mirror is up, thus enabling one to set the shutter for any desired exposure at will, without risk of exposing or fogging the sensitive film. Special provision is also made for keeping the film taut at all times, as well as for changing spools in daylight.

No. O Graphic

Another miniature camera introduced by Folmer & Schwing is the No. O Graphic, an instrument of the folding type, using No. O kodak film for negatives 1 5/8 x 2 1/2 inches; outside dimensions 3 1/8 x 3 1/2 x 5 inches; weight, twenty-three ounces. This camera is extremely compact for its capacity; it is fitted with an automatic sky shade, a focal-plane shutter with speeds from 1-10 to 1-700 second, and a brake of special design for controlling exposures. As listed, it is equipped with an anastigmat working at f 6.3, focal length 3 inches. The finder is of the direct vision type for use at a level with the eyes; by slipping in a folding mirror the instrument is converted into a deceptive angle camera, this device being extremely useful for certain classes of subjects. An enlarging cone is obtainable for use with this camera, by means of which enlargements up to postal-card size may be had with no more trouble than is involved in the making of a print.

1A Speed Kodak

This new addition to the kodak family (Eastman Kodak Company) resembles the 1A Graflex in general appearance, except that it is more compact and lacks the mirror and

Original and enlargement from a pocket camera negative
Dr. Nathan T. Beers

focusing hood of the latter. It is designed for use with 1A Kodak film, for negatives 2½ x 4¼ inches; its outside dimensions being 2¼ x 4½ x 9¾ inches; weight, three pounds. The 1A Speed Kodak may be fitted with any one of four well-known anastigmats, working at *f* 4.5, *f* 5.0 and *f* 6.3. The shutter is the Graflex Focal Plane model, built in the body of the box, provided with a series of slits of varying widths, regulated for exposures from 1-1,000 of a second to very slow instantaneous, bulb and time. This shutter is wound for any exposure by the half turn of a key and released by simple lever pressure. A direct vision finder, supplemented by a mirror attachment, provides for the location and composition of the subject with the camera at any desired position. Focusing is done with a rack and pinion movement, and tripod sockets are provided for stand use in figure or interior photography.

Premoette No. 1. No. 1A Special

There are two new models in the Premoette series (Rochester Optical Division Eastman Kodak Company), combining all the advantages in compactness, light weight and daylight loading conveniences which made last year's Premoettes so widely popular, but fitted with high-grade lenses and shutters.

No. 1 Special, for pictures 2¼ x 3¼ inches measures when closed 2⅛ x 3¼ x 4¾ inches, and weighs only eleven ounces. No. 1A Special, for pictures 2¼ x 4¼ inches, measures 2⅛ x 3⅝ x 5½ inches and weighs sixteen ounces. This size is peculiarly adapted for figures and landscapes. Either model may be had fitted with a rapid rectilinear lens, *f* 8 and single-valve automatic shutter; or with a Zeiss Kodak anastigmat *f* 6.3 and compound shutter, which offers a wide range of regulated speeds up to 1-250 second. For those whose photographic expenditures cannot pass a modest limit, these Premoette Specials will prove themselves altogether satisfactory as an introduction to the uses and advantages of small cameras.

Premograph No. 2

Although lack of space forbids any attempt to describe in this number the innumerable variety of 3¼ x 4¼ -inch cameras, I cannot forbear making an exception in favor

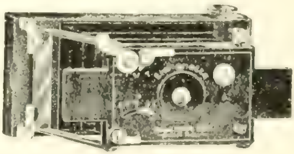
of the Premograph No. 2, just introduced by the Rochester Optical Division, Eastman Kodak Co. This is a reflecting camera for use with the film pack, fitted with rack and pinion focusing movement and high-grade optical equipment at an extremely moderate price. Its dimensions are 4 ½ x 5 ⅜ x 6 ⅛ inches, weight 44 ozs.

British Cameras

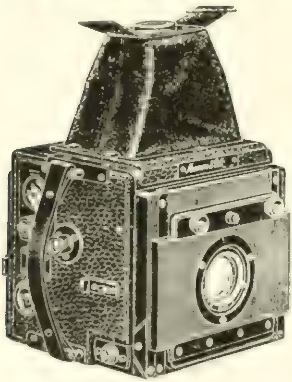
The small cameras of British make falling within our field are so numerous and diverse in variety that, beyond the brief mention given in the tabular list on other pages, only three or four outstanding models can be described.

Ensignette

To take the latest introduction first, we have the Ensignette (Houghtons, London), a self-contained, daylight loading roll-film camera for the upper vest pocket, measuring, when closed, 3 ⅞ x 1 ⅞ x ¾ inches, for pictures 2 ¼ x 1 ½ inches. The Ensignette opens and locks into position with a single movement.



It is fitted with an achromatic meniscus lens with apertures f 11, f 16, f 22, and the shutter is of the ever-set type. A "fixed focus" enlarger forms part of the outfit, permitting the enlargement of the small negatives to postcard size.



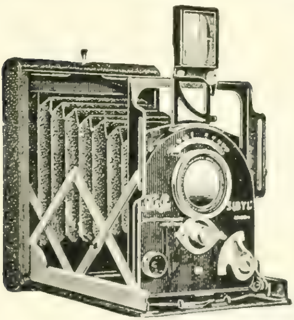
Dainty Soho-Reflex

This is a new model of the Soho-Reflex (Marion, London), for plates or film-pack 2 ½ x 3 ½ inches; outside dimensions 5 x 5 x 5 ½ inches. It has the usual focusing hood, fitted with a magnifying eye-piece; is equipped with a Zeiss Tessar $f/4.5$, focal length 4 ½ inches, a focal-plane shutter with variable slit adjustable from the outside, double extension

bellows, cross and rising front movements. Plate-holders of the block form carrying two plates are supplied with the camera, but it can be fitted with a changing magazine carrying twelve plates, or with an adapter for the film-pack

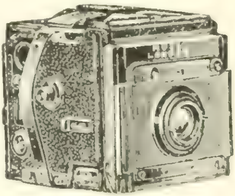
Vesta This is a folding pocket-camera (Adams, London), extremely compact in construction, measuring only 1⅜ x 3⅜ x 4¾ inches when closed, yet designed for plates or film-pack 2½ x 3½ inches; weight, 14 ounces. It is listed as fitted with Zeiss Tessar *f*.4.5 or *f*.6.3; the shutter is of the between-lens type, with speeds from 1-250 of a second to 1 second, time and bulb. The finder, of the direct vision type, has a folding mirror for use when the camera is held otherwise than at the eye-level. The lens and camera front spring into position for use at the infinity distance when the camera is opened, but focusing at any desired distance can be done with the focusing scale provided. The front has vertical and cross movement to the extent of one quarter of the plate, and the finder registers this action—a long-desired convenience.

Sibyl Another very compact pocket-camera of the folding type is the new Sibyl (Newman & Guardia), for plates or flat films 2½ x 3½ inches. When closed, with a plate-holder in position, it measures only 1 3/16 x 3⅝ x 5 inches, and is without exposed parts or projections. It is fitted with a Zeiss Tessar *f*/6.3 (or Cooke lens *f*/6.5); a self-capping, pneumatic shutter giving tested speeds from 1-100 to ½ second; has a vertical rising front moving to the extent of one-third of the plate, and can be set to any focus from 6 feet to infinity. The plate-holders, like the camera, are of metal, carrying one plate. This is also obtainable for 3¼ x 4¼ plates.



Kibitz The special features of the Kibitz (May Company, Liverpool) are its rigidity combined with lightness of construction and extreme compactness. It is designed for plates 2 ½ x 3 ½ inches or flat films without an adapter; measures only 1 ¼ x 3 x 4 ½ inches and weighs fifteen and one-half ounces. As listed, it may be had fitted with Zeiss Tessar *f* 4.5, or Goerz Dagor *f* 6.8, or Goerz Celor *f* 4.8, or Nettel anastigmat *f* 5.6, mounted in the compound lens shutter, with speeds up to 1-250 second. The finder is the brilliant box form, springing automatically into position as the camera opens.

Ross F.-P. Reflex The Ross Focal-Plane Reflex (Ross, Ltd., London), for negatives 2 ½ x 3 ½ inches, dimensions 5 x 5 x 5 inches; weight two and one-half pounds, has all the movements and adjustments usually found in the larger instruments of this class; the collapsible focusing hood is fitted with a single magnifying eye-piece and can be instantly detached from the ground glass if desired. It is provided with a rigid extension of seven and one-half inches, and a focal-plane shutter with adjustable slit apertures, giving a wide range of exposure speeds. Among the anastigmats fitted to this camera are the Ross Homocentric *f*/6.3, five inch focal length, or *f* 5.6 lens of the same name or the Ross-Zeiss Tessar *f* 4.5, of four and one-half inch focal length.



The Choice Here we must stop. If I have created in the reader's mind a desire to investigate the claims of the small camera, he can readily get particulars of all the instruments available from the various manufacturers. So numerous are the varieties offered, in fact, that the difficulty will be which camera to choose. This question must be answered by the preferences of the individual. In actual efficiency all the best small cameras are very much alike; but some will prefer plate cameras and others prefer film cameras. It matters little. Convenience favors the

film camera, but the use of plates has its advantages. For example: in the Lumière Sigma we now have a plate which is acknowledged to be fully twice as fast as the fastest film obtainable. On the other hand, it would be quite easy to show that much of the best speed work has been and is being made with roll film. For my own part, I choose the Goerz V.-P. Tenax simply on the points of bulk and construction. It really fits the pocket without inconvenience; it is strongly and beautifully made for practical service; and it has all the necessary adjustments. But already I see other small cameras which might win my later choice. The reflecting cameras, despite the fact that they are inconvenient in the pocket and are better carried slung over one's shoulder, or in the hand, are very helpful in focusing and following a moving object, or in the composition of a picture. They also have the advantages of the focal-plane shutter, and the extremely rapid lenses. Finally, we can combine the focal-plane shutter, the fastest lens, and the folding feature, with the advantages of roll films in more than one model. So that, in the end, each one must choose for himself, basing his choice on the features that appeal most to him.

Cameras in Use

In practical use, the manipulation of a small camera does not differ from that of an instrument of normal dimensions, except that some few points need emphasis because of the smallness of the image and consequent necessity for a little extra care and precision. This applies chiefly to finding or placing the subject and to focusing, in both of which details it will repay the reader to know the peculiarities of the camera in use by actual drill and practice with different classes of subjects.

Finding the Subject

For example: We need to be sure, before exposure, that the subject is properly placed or pleasingly composed within the limits of the plate or film used. With small cameras and negatives intended for after-enlargement, the height at which the camera is used needs particular attention because of its influence on the foreground or near objects. In the case of reflex cameras this is easy to manage, since we have the picture image, in full size,

right way up, visible up to the instant of exposure. Such cameras are naturally held in both hands, at a height convenient to the comfortable use of the focusing hood, with the fingers at or near the working points controlling the adjustments. Sometimes a light strap, fitted to the camera body and suspending it from one's shoulders, will be found helpful, as leaving the hands free for manipulation. This applies in wintry weather especially, when the fingers are apt to be numb and clumsy in movement. At other times, as when working in a crowd or where the immediate foreground is obstructed, the camera may be held upside down, extended in both hands above the head, the image being observed from below.

With folding cameras fitted with direct-vision finders, the practical position for use is at a level with the eyes. Here the foreground can be varied by working from an elevation or at the kneeling position, aided, of course, by the use of the rising front movement, if the camera is so equipped. If the finder is of the brilliant, box type, the camera may be held at any convenient height,—at the chest, under one arm,—but finders of this type are apt to be deceptive as to the amount of view really included on the plate. A few practical tests will decide the accuracy of such a finder and its proper use.

Some direct-vision finders are now fitted with a folding-mirror attachment, permitting the use of the camera as a deceptive angle instrument, i. e., enabling one to photograph an object without directly seeming to face it. Such an attachment is very useful at times with certain subjects, such as animals, children or groups.

The practical conclusion as to finders is that the reflex camera is likely to prove simplest and surest in use; and that for folding cameras it is well to equip oneself with both direct vision and brilliant finders, for use according to the requirements of the moment.

Focusing

The importance of facility and precision in focusing when using small cameras and lenses of large aperture cannot be overestimated. This detail has more to do with success and satisfaction than any other single point in

hand-camera manipulation, and yet it is the one detail most generally neglected. The thing aimed at is to learn where to place the point of principal focus so as to secure the maximum depth of definition and agreeably sharp definition throughout the whole field. With reflex cameras this is comparatively simple, since we have the picture image under our eyes, just as it will appear in the negative. Skill here depends upon individual judgment in fixing upon the most desirable point for the principal focus, and this can be developed by practical drill without the use of plates.

With folding cameras and direct vision or brilliant finders, we depend (1) on the accuracy of the focusing scale fitted to the camera for use with the lens employed, and (2) on our ability to judge correctly of distances. With regard to the first point, most of the high-grade small cameras are carefully tested and can be relied upon. But with low-priced cameras, or in case of any doubt, the focusing scale should be carefully tested by a series of exposures at measured distances, which will determine the point. Increased depth of definition, when any given distance is focused, can, of course, be secured by the use of smaller stops, but this means a loss of rapidity or speed. With regard to the second point, nothing but experience will avail us; but this experience should be secured by drill without the camera, and so need not involve waste of plates or film.

A Tip

It is generally advised that the best way to secure the maximum depth of definition is to focus on some point in the middle distance in the subject, and then stop the lens down (i. e. use a smaller aperture) to get the near distances in focus. This method is practical, but involves a loss of speed. Against this method I have the word of an expert in the use of hand-cameras, who says that it is better to set the lens at the infinity point on the focusing scale, and let the near distance come as it will. By this method, it is claimed that one gets greater depth of definition at *f* 11 (for example) than can be secured by the older way with the use of *f* 16—a decided gain in rapidity. Apparently this suggestion is based on the presumption that the "infinity" mark on most hand-

cameras is really the hyperfocal distance of the lens, which, in practical effect, gives the far distance very slightly diffused in focus (i. e. not critically sharp) and extends the depth of field to a point nearer the camera than the use of a true infinity point.

Hyperfocal Distances

Without going into an elaborate disquisition on focusing, it will repay us to give a little attention to this detail of hyperfocal distance. Practically, the term means the distance from the camera beyond which all objects will be in fairly sharp focus, and which gives the maximum depth of definition. This distance varies according to the focal length of the lens and the aperture in use—presuming for the moment that 1-100 of an inch is accepted as the standard disc of confusion. It can be found, for any lens and aperture, by the following simple formula: Multiply the focal length of the lens by itself, then by 100, and divide the result by the aperture (*f*) number, and by 12 to bring it to feet. For example: We require the hyperfocal distance of a 4-inch lens at *f*/4:

$$\frac{4 \times 4 \times 100}{4 \times 12} = 33 \text{ feet, 4 inches.}$$

A Handy Table

The following table gives at a glance the hyperfocal distances for lenses of various focal lengths and apertures.

Focal length of lens in inches	Diaphragm apertures or *f* numbers							
	f 4	*f* 5.6	*f* 7	*f* 8	*f* 11	*f* 16	*f* 22	*f* 32
	Hyperfocal distances in feet							
3	19	14	11	10	7	5	4	3
4	33	24	19	17	12	8	6	4
4 1/4	38	27	21	19	14	10	7	5
4 1/2	42	30	24	21	15	11	7 1/2	5 1/2
4 3/4	47	34	27	24	17	12	8 1/2	6
5	52	36	30	26	19	13	9 1/2	6 1/2

Its Uses

This knowledge of hyperfocal distances has several uses. If we focus on an object at the hyperfocal distance, we may be sure, not only that everything beyond that dis-

Reproduced, same size as originals, from pocket camera pictures
Dr. Nathan T. Beers

tance will be sharp, but also that all objects situated beyond one-half the hyperfocal distance will be sharp. For example: if with a 4-inch lens at $f/8$ we focus sharply on an object 17 feet away, then all objects 8 feet, 6 inches or more distant from the camera will be sharp.

Finding Depth of Field

Similarly, if we know the hyperfocal distance of a lens at any given aperture and focus upon an object at any given distance, we can readily ascertain what are the nearest and farthest distances between which everything wlll be sharply focused; in other words, the limits of depth of definition. To get the nearest distance at which objects will be sharp, we multiply the hyperfocal distance in feet by the distance of the object focused in feet, and divide the result by the hyperfocal distance in feet *plus* the distance of the object sharply focused in feet. To get the farthest point, multiply as before, but divide the result by the hyperfocal distance *minus* the distance of the object focused in feet.

For example: we have 4-inch lens working at $f/8$ and we focus sharply on an object 12 feet away. The hyperfocal distance for a 4-inch lens at $f/8$ is 17 feet (see table, page 30). Therefore, the distance of the nearest object in focus is:

$$\frac{17 \times 12}{17 + 12} = 7 \text{ feet.}$$

In like manner the farthest distance is:

$$\frac{17 \times 12}{17 - 12} = 40 \text{ feet, 8 inches.}$$

So that the depth of definition (or field) is 33 feet.

Resumé

We have learned something about the points of efficiency in hand-cameras, the advantages of very small cameras of high efficiency, the cameras already available and their principal features. After the choice of a camera, then, we come to its use. Here the factors making for success are (1) a thorough knowledge of one's apparatus and its capacities: to know how to use it with complete familiarity so that we can give all our attention to the subject in hand; (2) sufficient practical drill with finder, focusing scale and other movements, to enable one to

get the subject properly placed on the plate or film, and so focused that the whole of the image is satisfactorily defined for record or enlargement.

Subjects Available

In the choice of subjects for the small camera, we are limited only by the capacity of the apparatus and our ability in its use. By its compactness, lack of weight and bulk, and efficiency, we are at last given the means whereby we can get a record of things, as the eye sees them, when and where we find them; in the home, laboratory or workshop, in the crowded streets, at athletic games indoors and outdoors, in churches or in a sailboat, at dusk or on dull, wet days, in the fields and woods, among the flowers at close range, and so on, ad infinitum. The physician can make a record of a medical case or operation; the surveyor can record the progress of works under his care; the scientist can mark his progress at any desired point of study or investigation; the botanist, horticulturist and engineer have, in today's small camera, a note-book incomparable in capacity and usefulness. These serious uses of photography, opened up by the small camera as we now have it, will be obvious to those who have any knowledge of photography and who have lamented the limitations imposed by lack of efficiency or bulk in the apparatus until now available. But we do not get negatives by exposure in the camera alone. Let us turn to the processes of development and after.

Development

In the development of small negatives, there is no need to depart from the methods with which we are already familiar, but naturally we must exercise a little extra care to avoid frilling or puckering the edges of our plates, markings and similar physical defects likely to arise from the careless handling of wet gelatine films.

It has long been my hobby to reduce all methods and impedimenta to their simplest terms. In negative making this simply means the use of the tank system, whether for plates or films. It is, of course, quite practicable to follow the old way of developing each plate or film by hand if preferred; but with small negatives

this will be found tedious, and there is more liability of damaging the film during manipulation.

The Tank System

The use of a tank does away with all trouble and ensures better results in my experience. As far as roll films and the film pack are concerned, the manufacturers provide tanks for all sizes or easily adaptable to any size of film we use. For those who use plates the Eagle adjustable tank seems, at present, the only commercial tank available for plates smaller than 3¼ x 4¼ inches. Those who prefer a tank made for the special size of plate they use can readily have one made similar to the tank shown in the accompanying diagram, which was made for my use by a local tinsmith at a cost of two dollars.

The Author's Outfit; Goerz V.P. Tenax, Holders, Tank, Ruby Lamp, Developing Materials and Stirring Rod Thermometer

This tank is made of sheet copper, heavily nickeled. The handle of the basket or plate rack is pivoted so that it can be swung out of the way when plates are being loaded or unloaded. One of the rivets which fasten the handle of the basket is allowed to project an eighth of an inch, so that it can be hooked over the edge of the tank when the basket is lifted and held suspended to examine the plates during development. If one desires a tank which can be reversed during development, the

cover should be made the full height of the tank, and a rubber band put around the plates to hold them in place when the tank is reversed. This tank I had made for use with my Goerz V-P Tenax camera, for glass plates $1\frac{3}{4}$ x $2\frac{5}{16}$ inches. It is four inches in height, three inches in width, and two and three-eighths inches from front to back. When properly filled for use, it holds just twelve ounces of developing solution.

My Outfit

It may be well if, before going further, I briefly describe my photographic outfit as prepared for a trip involving a few days' absence from home. This is made up as follows: Two small snap-purses containing my Goerz V.-P.-Tenax and six plate-holders loaded with Lumière Sigma plates; the small, folding candle-lamp sold by the Eastman Company at twenty-five cents; one Eagle stirring-rod thermometer; my tank as described, into which I load six Brownie Developing Powders and a bottle containing sufficient acid-hypo powder to make sixteen ounces of acid-hypo fixing solution. An extra box of plates complete the outfit, which may be carried in the pockets of an overcoat, if desired.

Using the Tank

As tank development is practically an automatic process, leaving little to individual judgment or discretion, it may seem superfluous to describe the technique. Since, however, some of my readers may be unfamiliar with its convenience, and there are a few points worth knowing and remembering, I will outline the method I follow. This concerns the use of plates. Those who use roll-films or Filmpacks do not need a ruby lamp and should simply follow the booklet of instructions accompanying the tank they use.

If the room in which we have to work contains a wash basin with running water so much the better. If not, a supply of water should be provided. Now open and set up the ruby lamp ready for lighting when needed. Fill the tank, which, without the basket, holds exactly sixteen ounces of water, with water (this obviating measures) and empty it into any handy bowl or pitcher. Now dissolve in this the fixing salts—hypo and acid powders. This prepares the fixing bath. Now open one of the

packages of Brownie Developing powders. The red package holds the sodas required, and the blue package contains the pyro or developing agent proper. Empty the contents of the red package (sodas) into the tank and cover with warm water about one inch in height, stirring thoroughly until every particle of the soda salts is dissolved. The pyro, contained in the blue package, must not be added until just before we put our plates into the tank, so we lay this package in front of the ruby lamp, where we can readily find it in the dark. Now fill the tank with cold water to within an inch of the top—this gives us just twelve ounces of solution in the tank—and stir it, noting the temperature at the same time. This temperature should be 65°, as indicated on the stirring-rod. A very little experience will tell one how much warm water is needed to dissolve the sodas and give the right temperature for use when the cold water is added.

At this point the room should be darkened, all white light being excluded, and the ruby lamp lighted. Now remove the plates from their holders and slip them, one at a time, into the grooves of the plate-rack or basket. This should be done in the shadow of the body, as the plates are more or less sensitive even to the dull red light of the lantern. Having loaded the basket with exposed plates, we place it in the shadow of the tank for a moment, while we open the blue package of pyro or developing agent and drop the contents into the tank, stirring for a few seconds. Pyro dissolves instantly. The handle of the basket is now raised and the basket and its plates slowly but steadily lowered into the solution in the tank. This done, the basket should be quietly raised a little and lowered once or twice in order to break up any air bubbles caused by the first immersion. Now place the cover on the tank and note the time; count ahead twenty minutes and make a note of the time when development will be completed. Extinguish the light and leave the developer to do its work for twenty minutes.

Personally, I have not experienced any necessity for reversing my tank during development, as the construction of the basket keeps the plates fully half an inch

from the bottom of the tank, where the solution is apt to become dense. Once or twice during the twenty minutes, however, I give the tank a little shake or movement to stir up the developer.

Fixing and Washing

When the time limit of twenty minutes has elapsed, light the lamp, remove the top of the tank and pour away into the sink all the developing solution. Now fill the tank with cold water and pour this away to wash the plates and stop development. The fixing solution is now poured into the tank up to within an inch of the top, completely submerging the developed plates, and the top of the tank covered. All the rest of the work can now be done in daylight. In fifteen minutes the plates will be fixed and cleared of all white or gray deposit. The fixing solution can now be poured off into a bottle for future use, if desired, and the negatives thoroughly washed by placing the basket directly under the tap of running water for half an hour. When washed, the negatives should be taken out of the basket, drained on a piece of blotting-paper and stood on edge on any convenient shelf or ledge to dry, with a piece of blotting-paper under each negative. Do not attempt to dry small negatives in the rack; my experience proves that, dried in this way, they invariably show drying marks and patches of uneven density.

By this method, the manipulation of a dozen plates is robbed of all the usual tedium and uncertainties, takes a minimum of time and labor, and can be carried through without wetting the hands. The system is simple and can easily be mastered by the beginner; it calls for no expert knowledge or elaborate apparatus; and my experience has shown me that it gives a bigger percentage of clean, good printing negatives than the elaborate hand manipulation I followed in earlier days.

Prints

In the making of prints, every reader will follow his inclinations, using such papers and processes as seem to him most suitable. It is obvious that for small pictures the glossy or smooth surfaced papers will best render detail, and it is equally plain that development papers offer the greatest variety of surfaces, are best adapted

by their wide range of different emulsions to give the best results with different sorts of negatives, and offer the greatest convenience in use.

A Good Method

There is a little trick in handling small plate negatives in printing which saves a great amount of bother. A narrow white border about a small print is thought by some to help it considerably, and to accomplish this by masking is quite a fussy task. I am in the habit of printing my small negatives on paper large enough and sufficiently heavy to bind into book form. Thus I use 4 x 5- or 5 x 7-inch paper of double weight stock, according to the size of my small negatives. When dried, the prints may be trimmed a trifle all around to take off the rough edges; small holes are punched near the left edge and each dozen or two tied together in a simple cover paper with narrow ribbon or silk cord. The little trick in matting is as follows: Cut a plain mount, the thickness of the negative, to fit the printing frame. Lay the negative in the center of the mount and mark around it carefully with a pencil. Then, with the mount lying on a sheet of glass, cut out the rectangle with a sharp knife. If this is done properly, the negative should fit into the opening without any appreciable side-play. Cut four strips of black paper half an inch wide and paste them around the opening in the mount, with about one-sixteenth of an inch of the black paper extending over the edges. We now have a simple appliance which holds the negative in the center and mats it at the same time. Lay a piece of clean glass in the printing frame and on this the mount, then place the negative in position, and we are ready to make as many prints as we desire. Film negatives need only a black paper mat.

A good platinum print is a joy forever. The paper comes in many grades and surfaces and requires little after treatment.

Postal Cards

One of the pleasantest and most satisfactory uses to which these small negatives may be put is the printing of the pictures on postal cards. If we would delight our friends with the results of a day passed in happy com-

panionship, there is no more welcome surprise than a postal or two for them on the breakfast table. Nothing is more simple than their preparation. If films are used, a mat may be cut from black paper to suit the size of the negative or the portion of it which we desire to show; plates should be sunk into an opening in a mount such as I have described above, using a 5 x 7 printing frame with a mount cut to fit. Many very novel effects may be produced by double printing. All of these methods were described in THE PHOTO-MINIATURE NO. 94, which deals with the Postal Card.

Lantern Slides

Nor must we overlook the adaptability of the small negative for lantern-slide making. In this use of the small camera many serious workers will find its greatest advantage. For this special purpose the 2½ x 3½-inch camera is best suited, as giving negatives from which lantern slides may be made by simple contact printing.

Enlargements

Among the minor advantages following the more general use of small hand-cameras is the fact that the process of enlarging will be made familiar to many workers. To the average amateur the word enlarging brings a vision of tedious and complex operations, with mathematical calculations of various sorts. This is based on a mistaken idea. With the apparatus now available, and within the normal requirements of the hand camerist, enlarging is an extremely simple matter, and as interesting as it is simple.

Simple Enlargers

In the majority of cases, the enlargement wanted from the small negative will rarely exceed 5 x 7 or 6½ x 8½ inches. For this work the simple fixed focus enlargers, or the special enlargers made for use with small cameras, will meet all requirements. In all these we can use either bromide paper (which requires a dark-room in handling), or development papers, which can be manipulated in any room with the shades drawn. The manipulations are few and easily mastered. A piece of sensitive paper is placed in position at one end of the enlarging apparatus, the negative from which the enlargement is desired being placed at the other end. If

we are working with a "fixed focus" enlarger, the enlarged image is automatically focused sharply on the sensitive paper. The exposure is made by pointing the enlarger at the sky; the exposed paper is removed and development and fixing complete the process. It is in fact as simple as the making of a print. If an enlarger of more elaborate construction is used, the enlarged image is first brought to the desired scale or size and focused by a scale attached to the enlarging apparatus, the after operations being exactly as with the fixed focus enlarger. If artificial light is employed instead of daylight, a powerful illuminant, such as an incandescent gaslight is usually employed, with a pair of condensers between the illuminant and the negative used; but, once this additional outfit is acquired, the manipulation involves no serious difficulties. Whether daylight or artificial light is used, development papers will usually be found most convenient in use, although they are not so rapid as bromide papers. With them we have a large variety of different papers and surface textures for our choice in making the enlargement.

Apparatus Available

Beyond these simple enlargers, where very large prints are desired, we must, of course, turn to enlarging-cameras and lanterns; but these will rarely be needed by amateurs. Among the commercial enlargers of the simpler varieties, I may mention the Expo Printing Box or Enlarger, specially designed for those who use the Expo camera. This gives prints 2 x 3 inches of excellent quality. The British model (Ticka) also has its own enlarging-box.

For those who have film negative smaller that 2 1/2 x 3 1/4 or 3 1/4 x 4 1/4 inches, the Brownie Enlarging Cameras Nos. 2 and 3 will meet all ordinary needs. Nothing could be simpler than the making of enlarged prints, 5 x 7 or 6 1/2 x 8 1/2 inches, with these enlarging-cones, which are fitted with "fixed-focus" lenses.

For Goerz V-P Tenax negatives a specially designed enlarging outfit is provided, which includes a Welsbach light and condensers, the camera being scaled to give three sizes of enlargements, 3 1/4 x 4 1/4, 3 1/4 x 5 1/2 and 5 x 7 inches. This is a beautiful piece of apparatus, well

made, and cleverly designed for its purpose. It makes paper enlargements, or can be used for enlarged negatives, transparencies and lantern-slides. The makers of the No. O Graphic also provide an enlarging cone for use with this little camera, giving enlarged prints of postal-card size with exposures of about one minute.

Similarly, the Ensignette, Blocknote and other models are equipped with enlarging apparatus, details of which may be found in the makers' catalogues. In short, enlarging has been simplified to meet present-day requirements at every turn, so that with the small pocket-camera we can either get records for use as memoranda in compact form, or prints as large as 10 x 12 inches, or as we may need.

3¼ x 4¼ Cameras

Here our excursion must end. All that has been said of the very small hand-cameras applies, with equal force, to the 3¼ x 4¼-inch cameras, of which space did not permit me to speak in these pages. These have, to be sure, a little more bulk, and are not pocket-cameras in the real sense of the word, but they give prints of an acceptable size and will often enable one to avoid enlargement, if this be deemed too troublesome. N. T. B.

BOOKS

Focal-Plane Photography. THE PHOTO-MINIATURE, No. 77. 25 cents.

Photographing Outdoor Sports. THE PHOTO-MINIATURE, No. 91.

The Hand-Camera. By Wastell and Bayley. 50 cents.

Hand-Camera Photography. By W. Kilbey. 50 cents.

Advanced Hand-Camera and Focal-Plane Photography. By W. Kilbey. 50 cents.

Development (Gaslight) Papers. THE PHOTO-MINIATURE, No. 93. 25 cents.

Photographic Post Cards. THE PHOTO-MINIATURE, No. 94. 25 cents.

Leaves from an Amateur's Note-book. THE PHOTO-MINIATURE, No. 96. 25 cents.

Lantern Slides. THE PHOTO-MINIATURE, No. 9. 25 cents.

Notes and Comment

We note with interest and pleasure that Mr. R. James Wallace, who has in recent years made for himself a high place in photophysics, has taken charge of the research laboratory of the G. Cramer Dry Plate Co., St. Louis. This addition to the Cramer staff brings directly into the photographic field a worker whose equipment and capacities, brought to bear upon the practical problems of everyday photography, cannot but result in benefit to us all. Mr. Wallace enters upon his new duties direct from the Yerkes Observatory of the University of Chicago, where, for the past few years, specialist work dealing with color-sensitive plates, light filters, sensitometry and astro-physical photography has engaged his attention. He possesses a thoroughly equipped chemico-physical research laboratory, probably unequaled on this side of the Atlantic, and this, with his expert knowledge will now be devoted to the service of photography.

At this time of the year our table is crowded with innumerable booklets, leaflets and announcements from manufacturers, calling attention to novelties in apparatus and processes. As it is impossible to give these separate and detailed mention in this issue, we will briefly record some few titles, and urge our readers to send to the addresses given, and so secure copies for themselves. Each item mentioned contains much useful and really interesting information, and is well worth the trouble involved in sending the postcard request which will bring it promptly by mail.

Burke & James, Chicago: Ask for booklets about Watkins' Time Developer; Ingento Adjustable Tripod Top; Ingento Auto Tank Kits; Ingento Color Filters,

Series A, B and C; Ingento Vest Pocket Thermometer; Dallmeyer Stigmatic Lens, Series II.

Voigtlander & Sohn Optical Works, New York: Ask for descriptive lists of their 1909 Reflex, Alpine and Metal Folding Cameras.

E. B. Meyrowitz, 104 East 23d St., New York: Ask for folders of the new Zeiss Special Telephoto Objective *f* 10, for hand cameras; and the new Zeiss Convertible Protar Anastigmats.

C. P. Goerz, American Optical Works, New York: Ask for the album telling about the Goerz V. P. Tenax.

New camera catalogues, showing all the introductions and 1909 models can be had from the Eastman Kodak Co.; the Rochester Optical Division; the Folmer & Schwing Division; Gundlach Manhattan Optical Co.; and the Seneca Camera Manufacturing Co., all of Rochester, N. Y.

The Northern Photo Supply Co., Minneapolis, Minn.: Ask for their 1909 general catalogue; a complete reference book to the photographic market, and crowded with helps and conveniences for amateurs and professionals.

Briefly, but with sincere regret, we note the deaths of two devoted workers in the photographic world: Mr. Henry Bausch, of the Bausch & Lomb Optical Company, Rochester, N. Y., and Mr. John L. Yatman, for many years a representative of the Voigtländer & Sohn Optical Works, New York City.

Mr. Henry Bausch died at Augusta, Ga., in March last, after a brilliant career wholly devoted to the scientific side of photographic optics. He was widely known and esteemed for his many philanthropic activities in Rochester, and his death was mourned by thousands of his fellow citizens who had, in one way or another, benefited by his goodwill and noble life.

Mr. John L. Yatman died, suddenly, at Memphis, Tenn., in April, while on a business trip in the interests of his firm. He was a splendid type of the modern trade representative, well versed in his specialty of photographic lenses, genial, sympathetic, and always ready to help others with his practical knowledge.

Mr. Harry F. Hall asks us to advise his many friends in the photographic trade that he has severed his connection with the firm he has so long represented, and has taken charge of the photographic department of Faerst Bros. & Co., 12 Stone street, New York, and will at once enter upon the active introduction of a line of photographic developing agents and chemicals similar to those he has handled in the past. A list of the new products is in preparation and will be sent out within a few days. He also desires to extend his thanks to the trade for the unvarying good will and favors extended to him in the past, and to express the hope that these cordial relations may be continued.

Mr. George L. Barrows, who has been associated with the photographic trade for the past fifteen years, has undertaken the management of the photographic department of the Berlin Aniline Works, New York City, and is now devoting himself to a vigorous campaign for the well-known Agfa products. He will shortly visit the trade throughout the country in these interests, and bespeaks a generous complement of orders.

Everything "fits the pocket" now-a-days. Ansco Company, Binghamton, N. Y., offer free to all who will ask for them "The Twin Books of Photography"—two cleverly written and daintily printed vest-pocket text books on negative making and printing with development papers. We enjoyed half an hour with them, and got many useful hints out of their pages.

Several readers of THE PHOTO-MINIATURE have suggested that we prepare and publish a complete general index covering the contents of the first 100 numbers of THE PHOTO-MINIATURE, for the convenience of those who keep the magazine unbound, in its original covers, as easiest to refer to in this form. The suggestion is worthy of consideration. To put such an index into type and print, say, an edition of 250 copies, would

cost not less than $200. If 200 readers approve the suggestion, and will order a copy apiece, cloth bound, $1, postpaid, we will gladly undertake the labor involved and have the index ready on the completion of THE PHOTO-MINIATURE, No. 100.

"The British Journal of Photography" appears so regularly, week by week, that this belated notice of the "Colonial Number," dated March 26, last, may seem to savor of the obituary. But it was a splendid piece of work, in text, illustrations and advertisements, and must have given pleasure to colonials all over the world. Congratulations to Editor George E. Brown, who, in this and the famous "B. J. Almanac" more than realizes our expectations. The "British Journal," by the way, can now be had regularly on this side, the American agents being George Murphy, Inc., New York.

We are advised that steady growth in business has necessitated the removal of the Chicago branch of G. Gennert to larger and more commodious premises at 16-20 State street, Chicago, where a complete line of the Gennert specialties may be seen. Readers seeking the famous Ensign Roll-films, Imperial S. S. Plates and Hauff's developers, should not fail to give this house a call when in Chicago. Those nearer New York can obtain these imported specialties from G. Gennert, 24 East 13th street, New York.

A new list of "Selected Books Covering all Branches of Photography," including about 300 titles, giving the dates of publication, etc., has just been issued by Tennant and Ward, New York, and will be sent post free to any address on postal-card request.

Wratten and Wainwright, Ltd., Croyden, England, have just issued for free distribution a booklet entitled "More Orthochromatism," supplementing the information given in an earlier booklet "Real Orthochromatism," and listing their various orthochromatic specialties.

Books and Prints

All books noticed in these pages may be obtained from the publishers of THE PHOTO-MINIATURE, and will be promptly forwarded, postpaid, to any address on receipt of the publishers' prices as here quoted.

The Complete Self-Instructing Library of Practical Photography. Compiled and edited by J. B. Schriever and Thomas Harrison Cummings. 8 volumes; 3,500 pages; 1,800 illustrations; fully indexed; 6 x 9 inches. Bindings in three styles. Prices on application to the publishers. Sold on subscription in complete sets only. American School of Art and Photography, Scranton, Pa.

To attempt a critical account of this monumental work in the limited space at our disposal would be futile, and is unnecessary, since those interested can obtain a descriptive prospectus or see a specimen volume on request to the publishers. This last course we emphatically suggest, inasmuch as the prospectus fails to give an adequate idea of the wealth of information and helpfulness offered by the Library.

A careful reading of the eight bulky volumes proves beyond a doubt that the Library does all its editors claim for it, i. e., it covers the whole range of photographic practice in an orderly and systematic course of photographic lessons intended, evidently, for self-instruction.

The information is given clearly and concisely in a simple and straightforward way, first stating the principles and then giving the practical applications. This treatment of each subject is followed by supplementary chapters devoted especially to the difficulties of the work dealt with, and remedies for these difficulties. The beginner in photography will be especially appreciative of this method of instruction, which is practically identical with the arrangement followed in lecture and correspondence courses.

Apart from the usefulness of the Library as a complete, self-instruction course in photography for beginners and amateurs, the vast amount of practical information it offers will make it invaluable to the professional and advanced worker as a library of reference. The knowledge it presents is derived wholly from practical experience and thus has the special value of first-hand information. Each volume is set in numbered paragraphs and the illustrations are similarly numbered for reference to special paragraphs, every item being made instantly accessible in the very full index given with each volume. The illustrations represent the work of almost every photographer of note today—amateurs and professionals, in addition to which there are hundreds of engravings showing details of manipulation, apparatus, etc.

Vol. I deals with Elementary Photography; Vol. II, with Negative Development and After Manipulation; Vol. III, with General Exterior Photography, Composition and Lenses; Vol. IV, with Printing and Finishing; Vol. V, with At-home Portraiture, Flashlight and General Interiors, Copying, Enlarging and Lantern Slide Making; Vol. VI, with Studio Portraiture and Studio Systems; Vol. VII, with Carbon Printing, Commercial, Scientific and Color Photography; Vol. VIII, with Negative Retouching, Etching and Modeling. A Cyclopedic Index and Glossary of Photographic Terms extending over 160 pages, completes the eighth volume, and fittingly closes the Library, upon the completion of which we offer our sincere congratulations to its editors and their co-workers.

Die Stereoskopie (Stereoscopy in Theory and Practice). By Dr. F. Stolze. Price 5 marks. Halle a s.: W. Knapp. This is the second edition of Mr. Stolze's admirable handbook to stereoscopic photography and covers it subject from A to Z with plain facts and information. Apparently stereoscopic photography is more generally practised in Germany than in America for the publication of such a work on this side would assuredly be an unprofitable venture.

In Washington Square Park, New York

The Photo-Miniature

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EDITED BY JOHN A. TENNANT

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Stereoscopic Photography

It is a curious fact that few of us realize that our eyes see two distinct and slightly different pictures of every object to which they are directed. A simple experiment will make this plain. If you will take the trouble to shut your left eye, and in front of your right eye, about six inches from it, hold upright the first finger of your right hand, and then, six inches further away, hold up the first finger of your left hand in a direct line with the other finger, you will find that you can see only one finger—the nearest one. Now close the right eye and open the left one, and you find that you can see both fingers and that the farther finger is to the left of the other. If you reverse this procedure, using the left eye at first, the farther finger will appear at the right of the other. Now combine the two by holding the fingers some distance apart, but exactly midway between the two eyes, both of which are kept open, you will find that you can see both fingers distinctly. Close the left eye and the distant finger appears to the right. Close the right eye and the opposite is observed.

Herein we have a demonstration of what is known as binocular vision—seeing with two eyes. As the eyes are placed horizontally in the head and separated about two and one-half inches, so each eye sees only a different picture image, the left eye seeing more of the left side of the object and the right eye seeing more of the right side of the object; the two dissimilar images being blended or fused in the brain to form a single picture

of the object. In other words, our eyes are so set or placed that we are able to "see around" objects and estimate their lateral dimensions or solidity, to determine the shape of things, to appreciate the separation of objects at different distances and to see things in pleasing perspective.

Basic Principle

Upon this principle of binocular vision, which was studied and explained by Euclid two thousand years ago, stereoscopic photography is based. In the everyday photography with which we are all familiar, we get pictures of things as seen by a single eye—the lens. Stereoscopic photography gives us pictures of things as our eyes see them, re-creating the scenes or objects themselves, with depth, roundness, solidity, distance and perspective; giving a transcription of the subject perfect in all respects but two, namely, movement and color. No single or monocular photograph, however skilfully the lights and shades are handled, can do more than faintly suggest these qualities which make up the illusion of life and reality. Considering the fascination of this art within an art, the pleasure which the stereoscopic photograph gives and its obvious usefulness in education, in the sciences and many of the minor arts, the lack of interest in stereoscopic photography is passing strange. We are glad to note signs of a stereoscopic revival, and this little book is written with the intention of hastening the millenium.

Historical Note

The beginnings of stereoscopic photography go back to the earliest days of photography. The stereoscope was invented by Prof. Wheatstone in 1838, for use in viewing geometrical drawings, photography being at that time an undiscovered art. In 1845 the new art of Daguerreotypy was applied to the production of pictures for the stereoscope, and, with the introduction of photographic processes giving paper prints, and an improved form of stereoscope invented by Sir David Brewster (1849), stereoscopic photography quickly attained a world-wide popularity comparable only to the postal-card craze of today. In 1862 it had become, with the exception of portraiture, the most widely known and practiced branch

of photography. Gradually, however, the very popularity of the stereograph forced its production out of the hands of amateurs into commercial ways, and it became a specialized industry in the hands of many large firms. By this time Dr. Oliver Wendell Holmes had invented the hand stereoscope now in general use, and so widespread was the appreciation of the beauties of stereoscopy that every household throughout the civilized world had its parlor set of pictures and stereoscope. So, although millions of stereoscopic pictures are made and sold yearly here and abroad, the actual practice of stereoscopic photography as a branch of amateur and professional work has been almost completely neglected of late years here and abroad.

Characteristics

Today, however, there are many signs of a revival of interest in this beautiful art, and amateurs everywhere are turning to stereoscopic photography as a more perfect method of photographically recording scenes and objects of interest than any other process within our knowledge. In this belief they are right. There is no question of art or "pictorial effects" in stereoscopic photography. It is a method which gives us what the eyes see, with all the illusion of life and actuality—a technically perfect record. It is for those who want truth of reproduction, the thing seen by the eyes, rather than as it is interpreted through temperament. It is realistic in the highest degree and herein we have its greatest pleasures and its obvious value. With a few dozen stereographs of any given country or city we can learn more in half an hour about that country or city than can be learned in any other way save a personal visit. Following this line several firms, such as the H. C. White Co. and Underwood & Underwood (both of New York), have published hundreds of stereographic series or tours by which, comfortably seated at home, one may enjoy all the pleasures of a "personally conducted" trip in any part of the world without the many discomforts and inevitable expense of actual travel. The amount of pleasure and profit to be derived from these stereographic tours can be properly appreciated only by an experience with them. Similarly in education, in the teaching of geog-

raphy, entomology and other ologies, in the laboratory and workshop, in the reconstruction of models, in science, in anatomy and a thousand similar applications, the stereoscopic picture is unrivalled as a method of supplementing oral or text-book information. To the physician, anatomist or surgeon, stereoscopy is invaluable. With it he can record the complicated phases of various diseases, or the various stages of an operation. In the production of anatomical atlases and in the treatment of skin diseases, its use is a revelation of conditions otherwise difficult or impossible of observation. In the same way the commercial uses of stereoscopic photography are of no little importance. Thus it is employed to show the working of a manufacturing plant, laying bare with all the reality of ocular inspection every operation of the manufacturing process, the details of a machine in action and so on. Another use is found in the reproduction of commercial articles to be offered for sale, replacing the bulky samples usually carried by salesmen. It is sufficient here to indicate some of the wonderful possibilities of stereoscopy; in these pages we are more closely concerned with the use of the stereoscopic camera and the stereoscope for our personal pleasure, in the recording of familiar scenes about us or observed in our little journeys about the world. Let us turn then to the methods and apparatus available for practical work.

Its Simplicity

Let it be understood from the beginning that stereoscopic photography presents no special difficulties whatever. It is as simple in its manipulation and as certain in its results as the photography we already know. The whole art consists in making two pictures of the subject, such as our two eyes would form of the same subject, and then to arrange them for viewing so that they will blend or unite in one picture giving us the subject in its completeness. We need a stereoscopic camera to produce these two dissimilar pictures, and a stereoscope to blend or fuse them into the single picture. Most of my readers are already familiar with these, although they may not have used them. A descriptive note will therefore suffice.

The Stereoscopic Camera

It is possible to make stereoscopic photographs with the ordinary single-lens camera, but since there is little practical advantage in this method we will first discuss the simpler and more direct method in which a stereoscopic camera is employed. This consists of an ordinary camera which has a front board wide enough to accommodate two lenses horizontally separated by about three and one-quarter inches, and a partition inside the camera body, extending from the lens-board to the plate, and preventing the light from either lens spreading beyond the center line of the plate. The two lenses are equipped with stereo shutters which act simultaneously, giving exactly the same exposure to each of the two views on the sensitive plate. Exposure and negative-making are carried through just as usual.

In printing from the stereoscopic negative the two pictures must be transposed,—that is, the left-hand picture must be printed in the right-hand position, and vice versa. Formerly this constituted the only difficulty in stereoscopic work. It has been entirely done away with by the introduction of a printing-frame of special design which enables us to transpose the pictures during printing, so that the finished print simply needs mounting to be ready for viewing in the stereoscope

The Stereoscope

The stereoscope is simply a viewing frame of light construction, with an upright screen at one end in which two lenses are fixed. An adjustable vertical frame to hold the stereograph is attached to a track which extends about nine inches at right angles from the eye-screen. The instrument is usually held in one hand as close to the eyes as the hood of the lens-screen will permit, and the separation between the stereoscopic picture and the eyes is adjusted until the

The Holmes Stereoscope

combined image is seen to be perfectly sharp, which gives a transcript of the subject presenting all the illusion of reality.

The accompanying diagrams show the Holmes' Stereoscope in its present form, and the Lothian Stereoscope.

The Lothian Stereoscope with adjustable lenses

In the latter the lenses are adjustable to any desired separation and lenses of variable foci may be used.

Separation of Lenses

The characteristic qualities of the stereoscopic picture,— depth, solidity, roundness and perspective, are due, as we have seen, to the slightly different viewpoint from which the object is photographed by the two lenses of the stereoscopic camera. The separation of the two lenses is therefore an important point. As the distance between our two eyes is about two and one-half inches, theory would lead us to suppose that the lenses should be separated by the same distance. In practice, however, for stereographs of the standard size, a standard distance of three and one-fourth inches from center to center of the lenses is employed, although some stereoscopic cameras permit of the adjusting of the separation between the two lenses at any desired distance from two and three-fourths to three and one-half inches, to meet the requirements of different classes of stereoscopic work. Carl Zeiss, of Jena, has recently introduced a stereo camera in which the lenses are mounted on sliding panels in the front board and are connected by levers

The Ghetto, New York
Nathan T. Beers

An East Side Corner, New York
Nathan T. Beers

to a wedge-shaped track on the baseboard. By this device the separation of the lenses is regulated automatically in focusing, according as the object is near or distant. When the camera is racked out to focus on near objects, the levers draw the lenses close together, and similarly separate them when distant objects are brought into focus. A similar adjustment is provided in the Goerz Anschutz Stereo Camera. This adjustment, however, is a refinement chiefly employed in scientific stereoscopy, *e. g.*, in photographing small objects life-size, and is rarely adopted by the amateur whose camera is built with a definite separation of three and one-fourth inches between the lenses for every-day requirements. The chief reason for this standard separation, which is adopted by all manufacturers of stereoscopic cameras and shutters, is that it will give a very slight exaggeration to the relief in the picture and is in harmony with stereoscopes of standard manufacture, producing in the picture as viewed in the stereoscope the effect of looking at the view through an opening, which enhances the plastic effect.

Stereo Sizes

The size of the plate or film used for making stereo negatives may be as tall as you please, but the width of the plate is usually twice the separation of the lenses in use, as the center of each lens should be opposite the center of its respective half of the plate. The three principal sizes employed are 3 1/2 x 7 inches, 5 x 7 inches and 5 x 8 inches. These sizes allow for some trimming of the print, if necessary, the standard size of stereoscopic prints the world over being 3 1/4 x 6 inches. Since plates 5 x 7 inches are everywhere available, this is the size most generally used. Also with a stereo camera of this size, if we have an interchangeable front so that a single lens covering 5 x 7 inches can be substituted for the two lenses, we have a combined monocular and binocular camera covering a wide range of usefulness. Latterly, stereoscopic cameras of smaller than standard size have been introduced, especially by European makers, so that we now have small pocket stereo cameras using plates 1 3/4 x 4 1/4 inches or 2 1/2 x 3 1/4 inches or 3 1/2 x 5 1/2 inches. Of some of these we will treat separately in later pages.

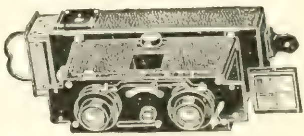
In many of the standard stereo cameras the front board carrying two lenses is made equal in width to the back of the camera. This insures perfect rigidity. In many models, also, the internal lateral partition is removable or folds up out of the way, so that the camera may be used with a single lens in the ordinary way.

Commercial Cameras

Thanks to the stereoscopic revival now well under way, and the popularity of small hand-cameras, stereo cameras are now available in a wide variety of different types. Thus we have extremely compact models fitting the pocket, for stereographs smaller than standard size; folding stereo hand-cameras; instruments of the reflecting type equipped with a wide range of movements; and the standard stereo view cameras for tripod use, as employed in commercial work. A complete survey of all the stereo cameras available in the American market can readily be had in the catalogues of the various makers, obtainable from any dealer on request. For particulars of the British and foreign stereo cameras, the reader is referred to the *British Journal Almanac* as the readiest and most comprehensive summary of that market. For the convenience and interest of the reader a few of the new stereo cameras of this season are here briefly described.

Stereo-photoscope

Taking the smaller cameras first, we have the Stereophotoscope (Voigtlander & Sohn, New York and London), giving stereographs 1¾ x 4¼ inches. This tiny camera measures only 2⅜ x 4 x 5⅛ inches, is made wholly of metal and weighs just less than thirty-two ounces. It can be conveniently carried in the coat pocket or slung over the shoulder by a strap. It is equipped with two matched Heliar



lenses (*f* 4.5), or collinears (*f* 6.8); a shutter giving several speeds; two finders—reflecting and direct view forms; and a magazine carrying twelve plates. I have used this instrument with great satisfaction, and some of the accompanying stereographs were made with it.

Verascope Similar in general construction and making negatives of the same size is the Verascope made by Jules Richard, Paris (E. H. DuVivier, New York). This camera, a marvel of efficiency and compactness, is obtainable in two models, in one of which rapid rectilinear lenses are used instead of high-grade anastigmats, which results in a less expensive instrument. It is adapted for plates or Filmpacks, and can be had with accessories for the use of Autochrome color plates.

Nanna I Another pocket stereo camera in the same size as the above is the Nanna I (Ferd. Franz Mayer, Dresden), which is adapted for use with plates or Filmpack.

Blocknotes; Spidos The Stereo Blocknote (Gaumont & Co., Paris and New York) is obtainable in two sizes: No. 1, giving pictures 1¾ x 4¼ inches, and No. 2, for pictures 2⅜ x 6 inches. This camera is of the collapsible pocket type and is fitted with matched anastigmats working at *f*.6.3. The shutter is of the guillotine type adjustable for various speeds. Another stereo camera made by this firm is the Spido, offered in two models: Spido No. 1, for plates 2½ x 5⅞ inches, and Spido No. 2, for plates 3⅛ x 6¼ inches. Both models are fitted with a variety of anastigmats and have a wide range of movements for different requirements. In the Spidos the central partition used in stereo work may be displaced, and the front board adjusted to center one of the lenses, which permits one to obtain panoramic pictures the full size of the plate. A special feature of the Blocknote and Spidos cameras is the great variety of attachments provided for use with them, for every conceivable use.

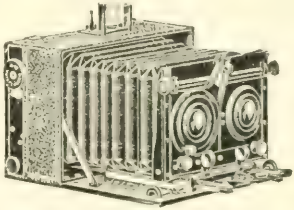
Stereo Tenax A new stereo or panoramic camera is being introduced in the Tenax series (Goerz, New York and London), making negatives 4 x 6 inches. The dimensions of this camera are 2¼ x 5½ x 7½ inches; it is equipped with anastigmats and a double shutter of new design. The frontboard permits of vertical and lateral movement, and, as indicated, the instrument is equally adaptable for panoramic or stereoscopic work.

Stereo Binocular Cameras

There are several stereo cameras on the market in the form of binoculars or field glasses, which do excellent work. One of these (Watson & Sons, London) is very ingenious in design and can be unreservedly recommended as a practical instrument. It gives negatives 2 x 4¼, twelve plates being carried in one of the tubes of the camera. The finder is the eye-piece of the binocular and in use one holds it to the eyes in the ordinary way, the picture being made at right angles to the direction in which the photographer is ostensibly looking. A similar camera, which could also be used as a theater or field glass if desired, was offered a few years ago by the Goerz Optical Co., but does not now appear in the firm's catalogue.

Stereo-Panoram

Voigtlander's Stereo-Panoram camera, for pictures 3½ x 5½ inches (adaptable for stereographs or panoramic pictures), corresponds in general features to the Voigtlander Heliar camera. Its dimensions are 3 x 5 x 7½ inches, and with the lenses it weighs three and three-quarter pounds. It is made of a light, aluminum alloy and is fitted with matched Collinear lenses with a separation of 2¾ inches, focal length 4¾ inches, and a focal plane shutter. A special feature of this camera is that it may be used to



give stereoscopic pictures, post-card or panoramic pictures not only with the double objectives, but also with the rear combinations of the objectives (of 8 inches focal length), this being provided for by bellows extension unusual in this form of camera. In both cases focusing is done by scales attached to the base of the camera. Now that 3½ x 5½-inch plates are everywhere obtainable, this three-fold camera should quickly win great popularity as an all-round instrument, giving three totally different classes of pictures with desirable choice of focal lengths.

Vanderbilt Cup Race, 9 A.M.; Raining
Nathan T. Beers

By Nathan T. Beers

Heliar Reflex-Stereo

Perhaps the most elaborate of small stereo cameras is the Heliar Reflex (Voigtlander & Sohn). This is an exact copy of the Heliar Reflex described on page 19 of our last issue, fitted with anastigmat lenses, focal plane shutter, rack and pinion focusing movement, rising front and other equally desirable movements. It takes plates or filmpack $1\frac{3}{4} \times 4\frac{1}{4}$ inches, or can be had in a larger size, making stereo negatives $4 \times 6\frac{3}{4}$ inches.

Other small stereo cameras, which space does not permit me to more than mention, are the models offered by May & Co., Liverpool; a new series named "Stereolettes" introduced by W. Butcher & Sons, London; the Multo Nettel (Staley & Co., London).

No 2 Stereo Brownie

As we get into larger sizes, the variety of stereo cameras becomes almost bewildering, every manufacturer offering models distinguished by some special feature or convenience. Among American models I may briefly mention the No. 2 Stereo Brownie (Eastman Kodak Co.), an attractive little camera for stereo pictures, each $3\frac{1}{4} \times 2\frac{1}{2}$ inches, with a capacity of ten exposures (roll film). The dimensions of this camera are $2\frac{1}{2} \times 4\frac{1}{2} \times 9\frac{3}{4}$ inches and it weighs only twenty-nine ounces. It is fitted with matched achromatic meniscus lenses and twin pocket automatic shutters, a brilliant finder and a focusing lock. At its modest price of $12, with the convenience of the tank system for development, this is undoubtedly the most persuasive introduction to the pleasures of stereoscopic photography available.

Stereo Hawkeyes

The Blair Camera Company offers two Stereo Hawkeyes, Model 3 and Model 4. They are of the folding-pocket type and make standard size negatives $3\frac{1}{4} \times 3\frac{1}{4}$ inches each on rollfilm, six double negatives or twelve single exposures to the roll. They are cameras of high grade and do entirely satisfactory work. Model 4 is equipped with a high-class double shutter and rapid rectilinear lenses which may be replaced by anastigmats if desired. It is built with double bellows and the frontboard allows of considerable rise when an undesirable foreground is to be excluded. This camera is deservedly

popular, and when fitted with high-grade lenses leaves little to be desired by the traveler who seeks lightness, simplicity and the assurance of good work. Some of the reproductions shown in this number were made with one of these cameras,—with the regular rapid rectilinear lenses supplied with the outfit. The self-transposing printing-frame of which I shall speak later is a part of the outfit which is supplied with these Hawkeye cameras, and may be purchased from any dealer. The development of the films is, of course, best carried out in the regular Kodak tank.

Century Stereo Compact

This is a new model introduced by the Century Camera Division (Eastman Kodak Company), measuring only 2½ x 6½ x 8½ inches, but giving stereo pictures of the standard size. It is fitted with matched R R lenses and has every desirable adjustment including rack and pinion for focusing, swing back, swing bed, adjustable front, automatic bed clamp, twin No. 3 automatic shutter, etc. The regular Centurys, Models 43, 46 and Century Grand Sr., can also be had fitted with the internal division and matched lenses and shutters for stereo work, so that these instruments are available for those who prefer them. As a matter of course, the regular lens and shutter for 5 x 7 pictures can be substituted for the stereo outfit when desired, so that they can be made to serve a double usefulness.

Century Stereo Special

This is another new model designed for high-grade work, and embodying several special features such as extreme compactness, anastigmat lenses and focal plane shutter; a drop-bed for wide-angle work at close quarters, and a bellows extension of seventeen inches allowing the use of long-focus lenses. Like the other Century stereo models it can be converted into a single plate 5 x 7 camera when desired.

Stereo Premos

The Stereo Premos, No. 4, 6 and 7 (Rochester Optical Division, Eastman Kodak Company), are simply the regular Premos listed under these numbers, but equipped with stereo lenses, etc. They are fitted with Planatograph lenses (*f*/8) and B. and L. Automatic shutters,

accurately paired; but may be used for regular 5 x 7 work by substituting an extra lens board with single lens and shutter. Anastigmat lenses can be fitted to these cameras if desired and, like all Premos, they permit the use of either plates or filmpack as may be preferred.

Stereo Koronas

These are known as Stereo Koronas, Series III, IV and V, and correspond to the regular Koronas with the same Serial Numbers (Gundlach-Manhattan Optical Company, Rochester, N. Y.), and have all the movements and adjustments of the regular models. The internal division may be instantly removed if it is desired to use the cameras as single plate instruments for 5 x 7 pictures. They are fitted with symmetrical lenses or anastigmats as desired. The Series VII Stereo Korona is similar in capacity to the other Korona Series, but is offered to meet the demand for a stereo camera of standard size at a reasonable price.

Seneca Stereos

These are offered in two series, A and B, corresponding in general features to the well-known Seneca No. 5 and Seneca No. 7 models, respectively. The internal stereo division in these models is constructed on the roller-blind principle, unrolling or rolling automatically as the camera is opened or closed. It can be removed at will, thus converting the instrument into an ordinary 5 x 7 camera. Seneca Stereo A, 5 x 7 pictures, is fitted with matched R R lenses and the Uno Stereo shutter. Seneca Stereo B has an extra-wide front and is equipped with high-grade symmetrical lenses.

Zeiss-Palmos Goerz-Anschutz

If one is willing to pay more money for his stereo outfit, there are several cameras on the market which are worth all they cost. Two I shall mention particularly, because I have tried them both and between them there is no choice: the Stereo Palmos (Carl Zeiss, Jena) and the Goerz-Anschutz Stereo. These are both of the folding or collapsible type, and are equipped with focal-plane shutters and the lenses of their respective makers. They are supplied with direct view-finders which compel one to use the camera at the level of the eyes—the best level for stereo views,—and allow of scale or eye focusing.

The Zeiss model is made in two sizes, $3\frac{1}{4} \times 4\frac{1}{4}$ inches and $3\frac{1}{2} \times 6\frac{3}{4}$ inches. The Goerz camera is of the regulation size $3\frac{1}{2} \times 7$ inches. In every detail of manufacture and equipment these cameras leave little to be desired. The central partition is removable, and one lens may be centered for panoramic views covering the whole plate. The frontboard allows of sufficient rise or fall to meet all emergencies, and the lenses are arranged on sliding panels, which permits of their being placed at any separation required. Most of my own work has been done with one of Goerz cameras and I can speak of it only in the highest terms. The focal-plane shutter, the Anschutz model, I believe to be the simplest and most efficient that I have ever used. It allows of speeds from slow bulb to $\frac{1}{1000}$ second or less, and is known as the self-capping type—the slit being closed when the shutter curtain is wound up. The setting of the slit and the regulation of the speed is quite simple; and, as the lenses used are so short, focusing is necessary only in special cases, the universal focus usually sufficing for ordinary subjects. With the Goerz camera one may obtain an extra bellows attachment by means of which sufficient extension is given to permit the use of the rear combination of the lenses.

Tripod Cameras

Concerning the ordinary stand or tripod camera used for stereo work, little need be said. Five by seven is the size usually employed, and in construction it differs from the regular 5×7 outfit only in its wider frontboard and the central partition dividing the bellows. Some form of shutter is required which will give simultaneous exposures; focal-plane shutters are made which may be fitted to almost any type of camera and are, in my opinion, more satisfactory than any other style.

Reflex Stereos

The number of reflecting stereo cameras on the market is small. J. Lizars, of London, lists several stereo cameras of different type and price, and one reflex stereo camera of great merit. This camera is known as the Challenge Combination DeLuxe Reflex, and makes either stereo or panel pictures. The plate-holders are arranged to accommodate smaller plates for the post-card size. The

By Nathan T. Beers

Coming Home from the Races

Nathan T. Beers

back division is of novel design and is made in two parts which are hinged top and bottom, so that when panel or post-card pictures are being taken they lie perfectly flat and out of the way. The camera is equipped with a first-class focal-plane shutter of the latest pattern. I have spoken above of the Voigtlander Heliar Reflex Camera which is made in stereo size, and can commend this outfit very highly to the professional or amateur desiring a high-grade machine.

Stereo Graflex This brings us to a consideration of the only American-made reflecting stereo camera, the Stereo Graflex. This camera enjoys the reputation of being the *de luxe* outfit of the trade, and to those who can afford to possess one it will be a "thing of beauty and a joy forever." Like all of the Graflex series, it is soundly built and will withstand any amount of hard usage and any climate. It measures, when closed, $8\frac{1}{4} \times 9 \times 8\frac{3}{4}$ inches, and makes two pictures on a 5 x 7-inch plate. The shutter is the well-known Graflex multiple-slit focal plane, with speeds from $\frac{1}{5}$ to $\frac{1}{1000}$ second. The rising frontboard works on a rack and pinion. This camera differs from all other forms of stereo cameras in the method of focusing. In the hood at the top of the box are placed two prisms so adjusted that the hood becomes practically a stereoscope. When focusing, the operator sees but one image and that image right-side up and in all the realistic beauty of nature. As each half of the resulting negative measures $3\frac{1}{2} \times 5$ inches, it will be seen that the photographer may use the entire five inches of height in his final print or select from it such portions of the negative that please him. This camera is much used by physicians and surgeons.

It has often been a matter of wonder to some of my friends and to myself why the No. 3A Graflex camera has not been adapted for stereo work. Its size is just right for a stereo post-card, and it so portable and compact that the traveler could ask nothing better for his use. Separate panels could be provided for the change of lenses, and the central partition could be made removable and in the form of a fan, and fastened to the under side of the mirror. With a camera of this sort, the photog-

rapher would have his choice of three sizes—stereo, one-half stereo and the full post-card.

Single-lens Cameras

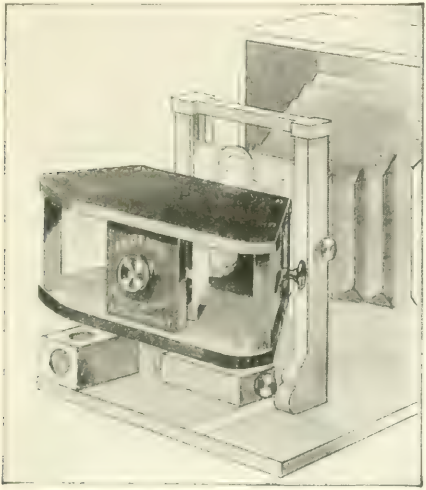
The making of stereoscopic pictures with a single-lens camera presents little practical difficulty, although it is perhaps somewhat tedious as compared with the use of the regular stereoscopic camera. Of the many methods suggested I will mention only two or three. It is obvious that, where the method necessitates two separate exposures, it is applicable only to subjects without motion, wherein the two pictures must be made simultaneously.

First, we can make the two separate views of the subject by simply moving the camera sideways for, say, three inches, between the two exposures, if we are working on a table or other rigid support permitting this movement. If we use a tripod, we need a frame or head with either two separate holes for the tripod screw, or a slot which will permit the tripod screw to move so that we can slide the camera the required distance to one side and make the exposures at the right separation. Another method is to use one lens mounted on a sliding panel which fits into tracks on the frontboard of the camera. The lens is first slid about an inch and a half to one side of the central line of the front and the first exposure is made. Now slide the lens to the other side of the central line and make the second exposure. In this method a screen must be used to protect one-half of the plate while the other half is being exposed. The simplest way to do this is to cut a piece of ferrotype plate so that it will form a central partition inside the camera, extending from the frontboard to within an eighth of an inch of the plate, and fixed within two saw cuts or slots at the back of the camera.

Brown's Attachment

The most ingenious device, however, for obtaining the stereoscopic pair with one exposure in a single-lens camera is the stereographic attachment invented a few years ago by Theodore Brown. This attachment is obtainable in the English market under the name Stereophoto-Duplicon (Fallowfield). A very similar attachment is available in this country in the Ingento Stereographic Attachment shown in the accompanying illustration

(Burke & James). With this attachment it is unnecessary to transpose the prints before mounting, as the image is transposed by the combination of the mirrors in the attachment. The image is focused with the attachment in place and appears on the ground glass



just as it will appear in the finished print or transparency. To get each image in correct position it is only necessary to manipulate the one mirror by means of the central thumb-screw, this adjustment being done as simply as focusing. By the use of optically flat mirrors coated with silver, this attachment does way with any increase in exposure.

Meeting an Emergency

Even for those who possess the regular stereoscopic hand-camera a knowledge of these methods of using single-lens cameras will often be useful. In my own case I sometimes find it desirable to make a stereoscopic record where my hand-camera lacks the focal capacity required for near objects.

To meet such emergencies I have adapted one of my larger cameras for this work. The camera which I use is an 8 x 10 Century Studio and is fitted with a cabinet back with sliding ground-glass and plate-holder; taking a 5 x 7 plate in either position, upright or lengthwise, in the holder. I bought a new frontboard and on this I screwed two hardwood tracks in which the panels holding my two lenses slide horizontally. This allows me to set them at any separation desired. For a central partition I made a spring-roller on which I glued the curtain. The roller was fastened to the inside of the backboard by means of screw-eyes and the front edge of the curtain was tacked to a narrow strip of blackened wood which in turn was attached to the frontboard. A small hole was drilled through one end of the rod on which the roller turns and an ordinary wire nail or pin placed through this hole, after the roller is in position, serves to keep the tension on the spring. It will readily be seen that this curtain changes its length automatically with the racking in or out of the frontboard. The curtain was made of ordinary rubber focusing cloth. It is a simple matter to attach or remove this partition and its application to a camera in no way mars it or prevents its use for ordinary work with a single lens. It is not necessary that the curtain should fit every indentation of the bellows; it would seem that the light would surely leak from one compartment to the other, but such is not the case, as practice has shown.

Level the Camera

In making stereoscopic pictures it is of prime importance that the camera be level. With the reflecting type or with the stand camera, both of which allow the operator to view the object on the ground-glass before making the exposure, this is not difficult; but with the hand camera, using a finder, one must watch closely lest he get the horizon line out of alignment. I mean by this that the camera must be level at right angles to the axes of the lenses; the front may be tipped a trifle up or down to cut out or include the foreground, but the camera must not be tilted from left to right or vice versa. The longitudinal lines in each picture must be the same distance from the top or bottom of the plate, and we shall

Along Third Avenue, New York
Made with the Multi-Speed Shutter

discover how important this is when we come to print the negatives in the transposing frame.

Focusing

As it is altogether desirable that we have perfectly sharp definition in the stereoscopic picture, from the nearest foreground to the farthest distance, the focusing of stereoscopic pictures with a focusing screen is preferable to the use of a focusing scale, as insuring greater accuracy in the division of the focus. Hence, the reflex type of a camera is the most perfect form for stereoscopic work.

Lenses

It is essential that the two lenses used on a stereoscopic camera shall be absolutely identical in focal length. For this reason lenses are usually offered "paired" or "matched" for stereoscopic work. This identity of focal length is essential because the images given by the two lenses must be identical in size and brilliancy.

Lenses of short focal length are usually chosen for stereoscopic work for two reasons, viz., depth of focus, and wide angle of view. Long-focus lenses will give better and more truthful perspective, but the angle of view will be much narrower and they will include less foreground than the short-focus, wide-angle lens. Thus, a lens of four inches focal length will give in a picture with a base of two and one-half the same angle of view as will be secured with a twelve-inch lens on a plate with a base of seven and one-half inches. As a general thing, lenses of from four and three-quarters to five inches focal length are chosen for outdoor work, but for interior views a lens not exceeding three and one-half inches in focal length should be selected.

With regard to the speed of the lenses, except for portraiture and subjects where movement is concerned, great rapidity is not essential or desirable. The average rapid rectilinear lenses will be found equal to all ordinary requirements, and a great deal of stereoscopic work is done with single achromatic lenses when conditions are favorable. For portraiture and subjects including movement, anastigmats working at $f/6.3$ or $f/4.5$ will be found necessary and, of course, such lenses are more widely useful than those of less rapidity.

Shutters

In order to ensure equal and simultaneous exposures for the two views which form the stereoscopic negative, the lenses of the stereoscopic camera are fitted with twin shutters, adjusted so that they are synchronous in action, opening and closing together. According to the common belief that lens shutters are variable and uncertain in speeds, it would seem to be difficult to get two shutters capable of working together with absolute accuracy; but experience has shown that the stereoscopic shutters offered by reliable makers are completely satisfactory in this detail. For everyday work and subjects which do not include rapid movement, the simple form of stereo lens shutters provided with the average equipment will meet all requirements. Where speed work is to be attempted, obviously, we must have a shutter capable of giving the brief exposures called for by such subjects. The focal-plane shutter suggests itself for such work, but a high-speed lens shutter such as the Multi-Speed is preferable, as giving greater depth of field and being less bulky. The street view facing page 75 illustrates the value of the Multi-Speed shutter for scenes including movement and depth of field. Similarly, the new Compound Koilos and Optimo Shutters are adapted for this work up to 1-300 of a second.

Plates or Films

Because until within the last few years the making of stereoscopic photographs has been almost wholly in the hands of commercial workers, the use of plates has been general. Now, however, we may use either plates, roll films or flat films with equal facility. The choice in this will be most naturally determined by the camera in use. As between fast and slow plates, it will usually be found that, where the subject will permit, the slow plate offers more latitude in exposure and a wider scale of gradation. Double-coated plates are advisable where we have to deal with interiors or strong contrasts of light and shade in the subject. Similarly, orthochromatic plates, with or without a color filter, will give obvious advantages in portraiture or wherever we have to deal with color. In the use of films, the non-halation and orthochromatic features are already provided.

Development In the development of stereoscopic negatives we desire softness and detail, hence, my recommendation of the tank method, which is peculiarly adapted to give negatives having these characteristics. In the choice of a particular developing agent the reader will be wisely guided by his own preference and experience. Metol is spoken of very favorably by many because it normally yields soft, detailful negatives, even with a certain amount of under-exposure. But there are some who cannot or will not use this developing agent. Rodinal, also, offers a special facility in securing delicately gradated and harmonious negatives. Personally, however, I prefer pyro, and use it to the exclusion of all other developers. Not that I have any quarrel with the newer developing agents, and I know that they will produce negatives equal to those made with pyro; but I have learned how to use pyro, and know what to expect from it. When I pour a pyro developer over my plate or film, I know what to expect and when to expect it, so that if things do not happen as they should I cannot blame the developer.

A Pyro Formula The formula which I use in all my work is the old-fashioned Seed's A B C Pyro Soda and, in making it up, I use the Eastman tested sulphite and carbonate of soda. In using this carbonate of soda, I prefer to take but one ounce to sixteen ounces of water instead of the two ounces of soda called for by the formula. I, therefore, give the amended formula as follows:

Solution A—Water, 16 ounces; oxalic acid, 10 grains; pyrogallic acid, 1 ounce.

Solution B.—Water, 16 ounces, Eastman's sulphite of soda, 2 ounces.

Solution C.—Water, 16 ounces; Eastman's carbonate of soda, 1 ounce.

Manipulation For use take one ounce each of A, B and C and 7 ounces of water. For double-coated plates use 14 ounces of water. The factor is 12. For tank use take 1 ounce of each solution and 32 ounces of water at 65° Fahr. and develop for 25 minutes.

This formula gives me, in the tank, a negative that is

fairly thin with the faintest suggestion of yellow or brown color just off the blue-black or, as some would call it, a warm black, such as gives the best printing negative.

The fixing of the negatives should be thorough but does not differ from the ordinary procedure. Washing under a spray tap for fifteen minutes will suffice to thoroughly cleanse the plate, and drying should be effected in a current of cool air. Drying plates in a rack is convenient but slow, and often tends towards unevenness in density. My dark-room has a window looking into an air-shaft. Over this window I have tacked a fine-meshed screen and I stand my wet negatives on the window-sill leaning against this screen to dry. A piece of heavy blotting-paper laid along the sill serves to drain the superfluous water from the surface of the plates. Films, of course, should be dried in the usual way by suspending the roll by a clip in a draught of cool air.

Choice of Subjects

In the choice of subjects for stereoscopic pictures it is desirable, almost essential, to have a strong foreground. This is often accomplished by the aid of a figure or some fairly strong feature set in the immediate foreground detached from the rest of the scene. This gives, or emphasizes, the sense of relief or distance, leading the eyes into the picture and breaking up the monotony of a plain or unrelieved space in the foreground. The use of this device is based on the fact that the appearance of relief or solidity is largely due on our seeing an object from two different viewpoints.

The distance away of the nearest figure or object in the foreground is in a measure dependent upon the separation of the lenses and the extent or depth of the field of view embraced by the lens. With the standard separation of three and one-fourth inches between the lenses and a subject possessing normal depth, as in the average landscape, the nearest object should be not more than twenty or thirty feet from the camera. In interior work, or where the depth of field is less than normal, the nearest object may, with advantage, be not more than six to ten feet away from the camera.

It must not be thought from this that some figure or special feature must be provided for the foreground in every instance. In photographing a subject across a stream or river, for example, the nearer bank of the stream, or a bush, or a boat moored to the bank will serve this purpose. In street views, similarly, a figure or a group of some sort in the foreground will usually give the desired sense of relief. In interior work, a chair or other article of furniture will accomplish the same result. This, obviously, chiefly concerns stereoscopic pictures made for pleasure. In stereoscopic portraiture, or where the stereoscope is used in educational or scientific ways, this device is rarely considered or applied.

Lighting the Subject

As far as the illumination and treatment of the subject is concerned, stereoscopic practice does not differ from everyday photography, except that the illumination of the subject should always be directed towards the securing of pleasing effects of light and shade, as contributing to the illusion of relief. Here, as in architectural photography, the lighting of the subject has much to do with our pleasure or satisfaction in the result. It is well known that one can photograph a building and obtain a flat, stale and unprofitable photograph, giving every line and detail of the building but lacking any suggestion of relief. The direction and force of the illumination are two factors which need consideration here. The lighting should be soft, harsh contrasts being altogether undesirable. If the high lights of the subject are white and chalky or the shadows are dull and lacking in detail, these patches will dominate the picture in the stereoscope, giving a very unpleasant effect. For this reason, negatives made in a fairly subdued light and well exposed, giving soft prints full of detail, are usually sought by experienced stereoscopic photographers. In keeping with this, a flat print will often present a more pleasing appearance in the stereoscope than one which is plucky or brilliant in its lights and shadows. We require, then, a soft negative, full of detail. This I obtain by giving about one-fifth more time than the exposure table calls for, the use of a plate inclined to soft-

ness and the employment of tank development. As definition for the whole of the planes of the picture is desirable, the lens is usually stopped down to *f* 16, although in portrait work, or wherever there is much movement in the subject, the larger apertures of *f* 8 or *f* 6.3, if available, may be used. With these large apertures, however, we lose depth of definition, and must give extra care to the focusing of the subject.

Printing

There are two methods of printing stereographs. The first, the older method, is to print the negative in the ordinary way in a 5 x 7-inch printing-frame and then cut the prints apart after development or toning. The newer method is to print the negative in a self-transposing printing-frame. With this method no cutting or trimming is required and the prints are mounted directly upon coming from the final washing-tray. When our negatives are made on separate pieces of glass or film—as they are when made in two exposures in a single-lens camera—we have but to transpose them in the printing-frame before printing, and our results are correct. But when the two pictures lie side by side on the same piece of glass, we must either cut them apart and transpose or, by the new method, transpose the paper in the printing-frame.

Why Transposing is Necessary

If the reason for transposing is not clear to you, the following may serve to inform you. As we know, the picture made on any negative is upside down, the same as the view on the ground-glass. And the right side of the landscape or object is shown on the left side of the negative, and vice versa. Now if we lay our sensitized paper down on the double negative in the printing-frame, and on the back of that half of the paper lying over the right negative we mark "right," and on that half of the paper lying over the left negative we mark "left," and then, after developing the sheet, we hold it face up before us, we will note that the picture marked "right" is at the left side, and the picture marked "left" is at the right side. Should we attempt to view this print through the stereoscope, we would note at once that something was wrong. And this is because

we would be looking at the pictures from positions opposite from which they were taken. In other words, we are trying to see with our left eye the picture which the right eye took. This phenomenon is known as pseudoscopy or negative stereoscopy, for by it relief is inverted into hollowness. And so it readily will be seen that what is known as transposition is simply the placing of the "right" picture on the right side of the print, and the "left" picture on the left side of the print, and to accomplish this we have our choice of cutting the negative in two and transposing the halves before printing, or using a transposing printing-frame with paper cut to the exact size of the desired print. The old method which is now obsolete, was to print the negative without transposing, marking "left" and "right" on the back of the print, and transpose in mounting after separating and trimming each half of the print. This older method is laborious and exacting, and I think has done more than anything else to discourage the amateur in taking up stereoscopic photography.

Self-Transposing Frames

The self-transposing printing-frame may be obtained from any dealer. It is made in two sizes: the Hawkeye, which is used for the standard size stereograph plate or film ($3\frac{1}{2}$ x 7 inches), and the Brownie, which takes the films made in the Brownie Stereo camera ($3\frac{1}{4}$ x $5\frac{1}{2}$ inches). If plates are used, the glass which comes in the frame is removed and the negative substituted in its place. As full directions accompany each frame, it is unnecessary to further describe the process other than to say that the paper used should be cut to the exact size desired in the finished print, or die-cut paper may be purchased to use with the apparatus. As the frame is about twice

the length of the negative, the negative being placed in the center of the frame, the left-hand half of the negative is first printed on the right-hand end of the paper by

pushing the paper to the extreme left, and then the right-hand half of the negative is printed on the left-hand end of the paper by pushing the paper to the extreme right. The accompanying figure shows the Hawkeye Self-Transposing frame. With the Brownie frame the process is a trifle different in operation but very easy to grasp. With some of the smaller outfits special self-transposing frames are offered by their makers. By using this method of transposition the making of stereo prints is as simple as ordinary work, and involves no special knowledge or judgment on the part of the amateur. No trimming is required, no measuring is necessary, and the prints are mounted directly as they come from the wash-water.

A Point in Trimming

There is one point of interest in trimming separate stereo prints for mounting about which I would like to speak. In order to enhance the plastic effect we are in the habit of trimming the prints so that more of the right-hand margin and less of the left-hand margin shows in the left print, while the right-hand print should show more of its left-hand margin and less of its right. In practising this "dodge" we are simply following out the law of binocular vision. You will readily perceive the reason for this by trying the following experiment. Stand a few feet from a window and gaze at the view outside. Now close the left eye and then the right, and you will observe that with the left eye shut you will see more of the left side of the view, and with the right eye shut you will see more of the right side of the picture. If you will turn to any of the stereographs shown in these pages, you will note that this dodge has been practised in making them. The self-transposing printing-frame takes care of this automatically, as it were, and it is only spoken of here for the benefit of those who wish to trim and mount their prints separately.

Mounting

If our prints are from negatives made with a stereoscopic camera of standard size and the prints have been transposed in the printing, the process of mounting them is exactly similar to the mounting of ordinary photographs. There is a standard size of mount, about 3½ x 7 inches,

which properly fits the average commercial stereoscope. When the stereoscopic pair are obtained from two separate negatives, care must be taken to transpose the prints in mounting. It is important to set the pictures absolutely level on the mount, and to so trim them that there is a space rather less than three inches between any two similar points in the foregrounds. This separation, of course, must in any case agree with the separation between the lenses used in making the negatives. This detail is provided for when the Self-Transposing Printing Frame adapted to the size of camera in use is employed, but is worth noting as a precaution.

Printing Papers

The best papers to use are those which give the most detail, such as glossy print-out or development papers, or, better still, those papers which have a semi-gloss. Rough paper is not suitable, as the rough surface gives a woolly effect in the stereoscope. The negatives having been developed for softness and detail and having been brought to a fair density, the soft grades of development papers should be selected for use. A properly developed print for stereoscopic viewing should have no harsh whites, or the effect in the stereoscope will be "snowy" and disagreeable. The ideal print is full of detail, but not by any means full of contrast. It should, in fact, be rather lacking in contrast, and quiet, not to say dull, in appearance. Black and white are better absent altogether, for the one will be too black and the other too white in the stereoscope. Some of the best prints we have seen were almost depressingly flat when looked at singly, but in the stereoscope this flatness quite disappeared, for the effect of relief induced by the stereoscopic conditions caused all the graduations to stand out, and gave what virtually amounted to an effect of contrast. It should be remembered that contrast in pictures is valuable mainly for imparting emphasis, or for giving relief to the principal features. In stereoscopic work we arrive at the same result by altogether different and less artificial means, and anything approaching an exaggerated contrast is not merely unnecessary but actually displeasing. The prints can hardly be too soft in character, provided they are full of detail and gradation.

Developers

The most popular developer for stereoscopic prints on gaslight papers is, without doubt, the standard metol-hydroquinone formula, a copy of which is enclosed with each package of paper. If glossy papers are used, we must add five grains of iodide of potash to each ounce of the stock solution used in order to prevent the abrasion marks to which glossy papers are subject. It is not necessary to squeegee the glossy prints on ferrotype plates as they give sufficient gloss when mounted dry. However, if the highest possible finish is desired, this may be practised. To some fingers, especially if hang-nails be present, metol is the cause of a slight skin irritation which is decidedly annoying. For such as are subject to this irritation, the Eastman Kodak Company offers a substitute formula which contains ortol in place of metol. I have used this formula in all of my gaslight paper developing for about a year and can vouch for the excellence of it. It is as follows: Hot water, 20 ounces; ortol, 48 grains; hydroquinone, 144 grains; Eastman's dry sulphite of soda, 1 1/2 ounces; Eastman's dry carbonate of soda, 2 1/2 ounces; bromide of potash crystals, 7 1/2 grains. To make this solution "non-abrasive," add 100 grains of iodide of potash. For use with "special" or Nepera papers take one ounce of the stock solution to four ounces of water. With "regular" papers use double the quantity of stock solution.

Avoiding Trouble

To some of us who are amateurs, nothing ever seems quite so good as the old metol-hydro formula. If your skin is susceptible to the irritating effects of metol, it is just as likely that it is susceptible to the effects of carbonate of soda and acid hypo. I have seen many cases of skin disease on the fingers of photographers who never use metol. However, we may avoid trouble in two ways; by protecting the skin with a saturated solution of paraffin in benzine,—dipping the fingers into the solution before beginning development,—and by keeping the fingers out of the solutions entirely. This latter method is accomplished by using a pair of tweezers for handling the prints in the developer, in the hypo bath and in the wash-water. Some months ago I suffered a severe

irritation of my fingers caused by experiments in which I had to use concentrated solutions of metol and, rather than give up my photographic work, was forced to adopt some means to keep my fingers out of water. I hit upon the scheme of using a pair of tweezers, such as a jeweler uses in handling diamonds, and I have never gone back to the old sloppy methods. A little practice will soon accustom one to use them very dexterously, and the constant drying of the hands between developing and printing is avoided.

Stereo Transparencies

With the small stereo cameras making negatives 1 3/4 x 4 1/4 inches, one may purchase a transposing printing-frame to fit this size of plate, and this frame serves in making transparent glass stereographs as well as paper prints. The process is the same as described above for the Hawkeye frame. Any of the plate manufacturers will supply the transparency plates. The following formulæ, suggested by the Seed Company, have proven very satisfactory in developing transparencies. Developer for Black Tones in Transparencies: Solution A.—Pure water, 24 ounces; dry sulphite of soda, 3 ounces; hydroquinone, 150 grains.

Solution B.—Pure water, 16 ounces; potassium carbonate, 2 ounces; bromide of potash, 15 grains.

To use, take of solution A 3 ounces; solution B 2 ounces.

Developer for Warm Tones in Transparencies: Solution A.—Pure water, 16 ounces; hydroquinone, 50 grains; dry sulphite of soda, 50 grains; bromide of potash, 24 grains; citric acid, 6 grains.

Solution B.—Pure water, 16 ounces; potassium carbonate, 480 grains.

To use, take equal parts.

An ordinary acid fixing-bath answers all requirements for fixing.

Stereographs in Color

It is a source of wonder to me that we hear so little of stereoscopic photography in colors. As we all know, the ideal stereograph is one made on glass—the stereoscopic transparency—which when viewed by transmitted light and slightly magnified by the lenses of the stereoscope,

is the most realistic and most perfect of all photographic records. The hand-coloring of stereoscopic pictures is, to be sure, one of the most difficult of arts; but today we have available a simple and wholly practical method of color photography. I refer, of course, to the use of the Lumière autochrome plate. Years ago the public clamored for plasticity and realism in the photograph, and it was forthcoming in the stereoscopic picture. Then the cry went up for color photography and this, too, has been realized. And now, when we have everything that the heart could desire—a combination of color and stereoscopy—we are afraid to try it.

To those who have not yet tried the autochrome process, I can only say begin at once. There are delights in store for you of which you have never dreamed. The process is simple and the results are certain if the directions are followed explicitly. It takes about twenty minutes to put a color plate through the entire process, and in thirty minutes you have the color record ready for viewing. Like the rest of the world, I was sceptical as to the practicability of the process; but out of my first box of four plates I got three pleasing transparencies, and the simplicity of the procedure amazed me. The fourth plate was accidentally dropped into the sink, so that my average was not so bad after all. Since then I have used the process extensively, and am of the opinion that most of the failures and troubles experienced in the use of autochrome plates come from following one's own ideas in the manipulation instead of the instructions sent out by the makers of the plates.

I have tried to show the simplicity and attractiveness of stereoscopic photography, without touching upon the many byways and applications which its use recalls to workers interested in widely separated fields. But, after all, the only real way to appreciate the pleasures and advantages of the art is to sit down with a stereoscope and a few stereographs of familiar scenes or subjects. This I advise the reader to do, feeling sure that a practical comparison of the stereoscopic picture and the familiar single photograph will, of itself, bring an irresistible desire to possess the ability to record things as the eyes see them—stereoscopically. N. T. B.

Notes and Comment

The suggestion, on page 45 of our last issue, of a general index covering the contents of the first 100 numbers of THE PHOTO-MINIATURE has brought us more responses than we looked for. It is extremely gratifying to note how widely and thoroughly the magazine is read and kept for reference. As for the Index in question, its publication depends upon the coöperation of 200 subscribers at $1 per copy. When, say, two-thirds of this number have ordered copies, the work will be put in hand without delay.

THE PHOTO-MINIATURE No. 99 is almost ready for printing and will be published about the 15th of July. It will deal with reflex cameras, concerning which there is a lack of reliable and practical information. The monograph is from the pen of an expert worker with this form of camera who handles his subject in a direct and comprehensive way, with many illustrations covering the handling and successful use of reflecting cameras.

"The Colorist," by J. Arthur H. Hatt, is a new book which will interest all who have anything to do with colors. It is the fruit of many years study and experiment on the part of the author and has been written "to correct the commonly held theory that red, yellow and blue are the *primary* colors, as well as to supply the much-needed easy method of determining color harmony." In keeping with the promise of this sub-title, Mr. Hatt sets forth his new color theory in a plain and unmistakable way, giving precise data whereby color schemes may be analyzed and beauty in color appreciated and produced, establishing a complete unity

between science and practice. Two color charts are provided, with masks for the simple determination of color harmonies for many different purposes in decoration, color printing, costume designing and the like. We have read this book with a great deal of pleasure and recommend its perusal as a distinct contribution to the literature of color. (New York: D. Van Nostrand Co.)

Outstanding among the camera catalogues of 1909, the new list of the Seneca Camera Company, Rochester, N. Y., attracts the eye by its cleverly colored cover design. The catalogue itself, consisting of 64 handsomely printed and decorated pages, lists the various cameras and accessories of the Seneca Company, with abundant descriptive matter for the guidance of buyers. Among the 1909 improvements we note that Senecas No. 6 to No. 9, inclusive, are fitted with reversible backs and equipped with the new Seneca lens and Optimus, Koilos, Volute and Sector shutters giving a wide range of speeds. Another new feature is the flat suit-case arranged for carrying Seneca view cameras. Every reader should send for the new Seneca catalogue.

The old adage that "seeing is believing" applies in a special way to stereoscopic transparencies as proof that the stereoscopic picture is the best of all photographic records. Readers residing in or visiting New York should make a note to call upon E. H. DuVivier, 30 Church street, New York, and ask to see the remarkable collection of stereoscopic transparencies imported by Mr. DuVivier to demonstrate the advantages and efficiency of the Verascope camera, for which Mr. DuVivier is the American agent. The collection is one of the finest we have seen and is bound to awaken enthusiasm in all who view it.

The radical improvement in photographic shutters represented by the Multispeed Shutter, introduced a year or so ago, together with the startling claims as to

its efficiency made by its manufacturers, seem to have awakened a certain amount of scepticism. As a consequence, hardly a week passes without some question about this shutter: "Will it do what is claimed?" "Is it really as fast as a focal-plane shutter?" and so on. We are, therefore, glad to make room for the letter which follows, which explains itself.

Pleasantville, N. Y., June 12, 1909.

MR. KENT A. PARKS, Huron, S. D.

Dear Sir:—Your letter of the 6th inst. was forwarded to me from Marietta, Ohio. I suppose that you saw my testimonial to the Multi-Speed in "Shield's Magazine" or in the booklet descriptive of the shutter.

Any statement I made is absolutely true, and a trial of the shutter will verify it. Several days ago I exposed two Lumière Sigma plates on the same subject, day-dark, slight rain falling. By error, the first was given 1-25 of a second, and was badly overexposed. The second at 1-200 was correct and brilliant. Instances may be multiplied showing that the Multi-Speed gives the same results in illumination as the ordinary shutter at speeds from ten to twenty times greater. Exposures of 1-1000 second develop normally fast and strong; in fact, I have seen an exposure of 1-1000 second on the water, with 6.8 lens, that was practically overexposed.

The whole trouble with the focal-plane shutter seems to be in the necessary distance at which the slit is run from the face of the plate. Could the slit be run in optical contact with the plate, the efficiency, I think, would be perfect at all apertures, but with a 1/8 inch slit located three times its width from the plate the illumination seems to fall off in the ratio of about nine to one. The illogical feature of the focal-plane shutter is that it consists in diaphragming in front of the plate, and while this absurdity has been apparent to theorists and practical workers, the manufacturers of the focal plane have studiously avoided any mention of the fact. The statement of 100 per cent efficiency, except on low speeds, is absolutely false. The focal plane equals the Multi-Speed in efficiency up to about 1-150 second; at 1-300 the latter is superior about four to one and, in

my opinion, about six to one on highest speeds. Mention might be made that the focal-plane speeds are generally overestimated, the 1-1000 being probably not better than 1-700.

I advise you to get this shutter on trial. It is very strongly and simply constructed, containing far less "clockwork" than the ordinary leaf shutter, and I am convinced the results will be a revelation to you.

Yours truly

W. S. CROLLY.

Messrs. Burke & James, Chicago, advise us that they have improved the Ingento Stereo attachment referred to on another page of this issue. In this new attachment a novel mechanical device is provided which operates the two mirrors simultaneously so as to get exactly the same focus on each image. The first attachments sent out were made similar to an English model, which has one mirror permanently fixed, while the other is operated with a screw device so as to bring the same point in each image the proper distance apart. They have also improved the means for dividing the two images in the center which is now secured by two brass wings operated by studs, which project from the top of the attachment instead of by grooves, as in the old attachment. This makes the Ingento Stereo Attachment simpler in action and more certain in results, and will undoubtedly be welcomed by those who, for any reason, prefer to use a single-lens camera for stereoscopic work.

The new catalogue of Korona Cameras, just issued by the Gundlach-Manhattan Optical Co., Rochester, N. Y., is decidedly the most attractive list yet published by this house, whose lenses and cameras are so widely and favorably known. Especially commendable is the feature which separately describes and illustrates particular details of Korona construction, such as the adjustable front locks, the wide-angle bed, horizontal level and other Korona conveniences. So many novelties and improvements in the Korona series are fea-

tured in this list that readers interested in the evolution of the American camera should not fail to get the catalogue and see for themselves. Here we can only mention the new Korona adapter for Filmpacks; the Korona and Criterion view cameras; Turner-Reich Convertible Anastigmats *f* 6.8 fitted to high-speed Compound and Optimo Shutters; the Achromatic Meniscus Portrait Lens, *f* 6 for pictorial portraiture; and the Pancratic Telephoto lens for 4 x 5 and 5 x 7 cameras. The catalogue is beautifully illustrated.

One of the first fruits of Mr. R. James Wallace's connection with the G. Cramer Dry Plate Co., of St. Louis, is the new Isos Filter, adjusted for use with the Cramer Isochromatic plates. Those who have yet to appreciate the great advantage of using a filter adjusted to an isochromatic plate should write to Messrs. Cramer for information. The introduction of the Isos Filter means a definite improvement in negative-making for all who use Cramer's Iso plates, and its advantages should not be overlooked.

The new catalogue of the Wollensak Optical Company, Rochester, N. Y., cleverly displays the many products of this concern, and gives abundant evidence of life and progress. Among the novelties we note a new shutter, the Optimo, which embodies the latest ideas in shutter construction, combining high speed capacity with simplicity of operation and reliable construction. The Optimo has a five-leaved aperture, the parts of which revolve in making the exposure, one end passing from the opening and the other end taking its place. This ingenious design not only makes high-speed exposures possible, but also gives the greatest possible illumination to the plate—a big gain in efficiency over earlier designs. Besides "Bulb" and "Time" exposures the Optimo has a range of automatically controlled exposures from one second to 1-300 of a second. Despite its high speed the Optimo is set and released by push buttons and works without jar or

recoil, a feature which will be appreciated. A detailed description of the Optimo and other specialties is given in the catalogue, copies of which the Wollensak Optical Company will gladly send to any address on request.

The well-known Wellington printing papers, made in England by Wellington and Ward, are now obtainable in this country through Ralph Harris & Co., U. S. agents, 30 Bromfield street, Boston, Mass. The Wellington Bromide Papers comprise no less than eighteen grades for contact printing and enlarging, so that the introduction of this line adds materially to the choice of bromide papers available for American workers. In gaslight papers the Wellington S. C. P. (Slow Contact Paper) is available in thirteen grades. This brand is a great favorite with British workers and is perhaps more widely used than any other development paper made in Britain. For those who prefer a self-toning paper there is the Wellington Self-Toning Paper which we can recommend from our experience with it. Descriptive circulars and lists of all the Wellington specialties can be had from the importers as above.

Books and Prints

All books noticed in these pages may be obtained from the publishers of THE PHOTO-MINIATURE, and will be promptly forwarded, postpaid, to any address on receipt of the publishers' prices as here quoted.

Composition in Portraiture. By Sydney Allan (Sadakichi Hartmann). 116 pp., 137 illustrations. $3.00. New York. Edward L. Wilson. The composition of the figure in portraiture, commonly spoken of as the "pose" or arrangement, is admittedly among the most difficult of the photographer's problems. For this reason all portraitists, whether professionals or amateurs, will welcome Sydney Allan's book. In the writer's opinion, it is the clearest and most helpful work on the subject yet offered to photographers, being written wholly from the photographic viewpoint and dealing with the everyday portrait work of the average studio. The abundant illustrations make the lessons plain and practical, so that the photographer can hardly fail in their successful application. We commend it to photographers and "operators" as a book to be read and re-read, worth many times its price.

The Photography of Colored Objects. By C. E. Kenneth Mees, D.Sc. 75 pp., with 14 full page illustrations, color chart and photogravure frontispiece. Paper boards, 50 cents, postage 6 cents. New York: Tennant and Ward.

In this slender but extremely interesting volume Dr. Mees gives us what has long been wanted: A clear and direct explanation of the theory underlying the photography of colored objects, and some account of the practical application of the theory in various branches of

every-day photographic work. The first two chapters deal with light and color in photography, the sensitiveness to colored light of the eye and of photographic plates. Chapter III has two sections (1) on the multiplying factor of any sharp-cut filter and (2) on orthochromatic screens. In Chapter IV the interesting subject of rendering color contrasts and of obtaining color contrast for special purposes is dealt with. This chapter will be welcomed by commercial photographers and specialists who have to emphasize differences of color in reproduction work, e. g., in photographing documents written in colored inks, furniture, colored prints, and so on. Portraiture, reproduction or process work, and landscape photography have separate chapters devoted to them, and the book closes with a clever summary of the theory of additive and subtractive methods of tri-color photography.

A special feature of the book is noted in the fact that its author enlisted the coöperation of specialists to an unusual extent in its preparation. Thus, the chapter on tri-color photography was written by A. J. Newton, while that on landscape work was drafted by M. André Collier and so on. The illustrations are notable as clever examples or lessons proving the many advantages claimed for the use of color sensitive plates and adjusted filters.

Die Diapositivverfahren (Lantern Slides). By G. Mercator. Price 2 marks. Halle a/s.: W. Knapp. With characteristic thoroughness, this volume discusses the production of lantern slides for all purposes and by all modern processes, including the making of autochrome slides, with chapters on coloring by dyes, oil and water colors.

Deutscher Camera-Almanach, 1909. 263 pages, 180 illustrations. Paper covers. Price $1.25. Cloth $1.75. American Photography. Boston. This popular German *Almanac* is very similar in makeup to *The American Annual*, offering a score of articles on photographic practice by eminent workers, together with innumerable

illustrations selected from the recent work of European pictorialists. These illustrations are beautifully printed and the volume is crowded with interest and suggestion.

Home Portraiture is a cleverly written and well-illustrated brochure issued by the Bausch & Lomb Optical Co., Rochester, to advertise the virtues of their anastigmats for all work of this class. The Diagrams and data accompanying the pictures show just how these latter were secured, so that the reader can duplicate the results if desired. Every one interested in the possibilities of home portraiture should see this little book, which can be had free on request to the publishers.

The Stereograph and the Stereoscope. What they mean for individual development and what they promise for the spread of civilization. By Albert E. Osborne. 288 pp.; with drawings. New York: Underwood and Underwood.

Those who desire to know something of the significance of stereoscopic photography as a means of pleasure and education will find in this book a guide, philosopher and friend. It is the tribute of an enthusiast who has given years of loving devotion to his hobby, and nothing is lacking, either of interest or completeness in his survey. The book is intended, in a special way, to show the advantages of stereoscopic photography as a home travel system, by which one may familiarize oneself with all this world and all the glory of it without the expense and discomfort of actual travel. From this viewpoint it serves as an introduction to the travel systems, made up of maps, stereographs and descriptive tours, introduced by the publishers of the work some years ago. Thus far our notice covers the first part of the book. Part II is devoted to a philosophical consideration of "Life" under the general heading "What are the Necessities of Life." This section is made up of ethical and moral opinions, in which domain the thoughtful reader may question the authority of the author to speak. In our opinion this section could have been omitted with advantage.

A Business Dispute

Showing the advantages of the reflex in focusing and arrangement of subject, at close quarters, unknown to the persons in the picture

Rothenburg from the Tauber Valley

Taken with the reflex camera held in the hand, showing the exactness of placing subject on the plate even when the front is raised to the full as, obviously, it must have been in the above instance. The print here shown includes everything in the negative except for a small strip trimmed from one side.

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Reflex Cameras

It can scarcely be supposed that there is one reader of THE PHOTO-MINIATURE in ignorance of the principle of the reflex camera. However, by leave of the majority of just persons who need no explanation, let it be said that in a reflector or reflex camera, as the name indicates, there is placed opposite the lens a mirror which prevents the image from being cast in the ordinary way upon a ground-glass at the back of the camera, but reflects it upon a focusing screen prepared in the top of the camera, which ground-glass is placed so that the path AB–BC, traversed by the rays of light, is exactly equal to the direct path AD,

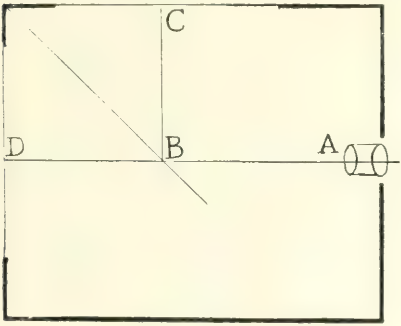


FIG. 1. *A*, Lens; *B*, Mirror; *C*, Focusing Screen; *D*, Plate

which they traverse when the mirror is raised, and, as is usually the case, the shutter thereby released to expose the plate. (Fig. 1). The crude sketch is a poor compliment to the reflex principle as embodied in the beautifully designed cameras now made, but it will

serve to explain matters to our minority of one. The majority, we can assume, know the reflex, are interested in it, and are perhaps thinking of purchasing one. The questions which very likely are in their minds are such as:—What are the real advantages of the reflex? Are there drawbacks of which reflex advocates say nothing? Is the reflex worth what it costs? And, coming closer to the commercial point, is it worth while to pay the big prices of the most expensive instruments? It will be best to clear the ground as to these matters. And there are facts to be stated *pro* and *con* the reflex camera.

Focusing

Obviously the device of using a mirror in the way shown above is a means of both focusing and selecting the subject in hand-camera photography; that is to say, the reflex camera replaces the focusing scale by an eye-method and throws a full-size finder in with the bargain.

Taking the question of focusing first, every user of a hand-camera knows that except under certain conditions (unfavorable to the best photography) accurate focusing by aid of a scale calls for a fair amount of practice in judging the distance of the subject.

If the lens be stopped down to *f* 16 or *f* 22, even large mistakes in judgment will not matter since the "depth of focus" is enough to make good. The same thing is true when using a tiny camera with a lens say of two inches focus: In this case the very shortness of focus gives the depth, and the aperture may be as large as *f* 6 for a high degree of certainty. But it is when a lens of five or six inches focus, working at *f* 6 or *f* 8, is used—as it is in most hand-camera work—that skill is needed in judging distances. Some pick up this knack quickly; others, never; but even a most practiced worker who has learnt his distances, say, in streets, will most likely misjudge in more open surroundings such as the baseball or cricket field or sports track. But the certainty of getting subjects sharply in focus every time becomes the possession of the merest beginner as he comes out of the dealer's store with his reflex in his hand. And more than this; the reflex method allows of focusing sharply under conditions when an expert user of the scale-focusing method cannot be certain.

Depth of Definition

In writing just now of depth, we mentioned a five- or six-inch lens at $f/6$ or $f/8$ as the average instrument of the hand-camera worker. "Depth," the crux of the problem, is small in this case compared with the lens of $f/16$ aperture, used in the fixed-focus cameras. Taking as a fair standard for comparison the so-called hyperfocal distance, that is, the nearer distance beyond which all objects are in focus, the latter in the two cases is

Five-inch lens at $f/16$	13 feet
Five-inch lens at $f/6$	36 feet

In other words, at $f/6$ we must not let an object nearer than 36 feet be included when the lens is focused on the extreme distance, whilst at $f/22$ we can "let 'em all come" to within 13 feet of the camera. But note the difference if we use a five-inch lens at $f/4$, or use, say a ten-inch lens at $f/6$. In these cases the nearest distances of objects which will appear sharp at the same time as the extreme distances are:

Five-inch lens at $f/4$	52 feet
Ten-inch lens at $f/6$	140 feet

These differences are in the nature of lenses: there is no getting away from them, and the figures show why the use of the modern large-aperture lens, or of a lens of long focus, makes sharp focus with the hand-camera largely a matter of luck. The reflex cannot increase the "depth," but it enables the user to localize the focus on one spot with the utmost readiness and certainty. On this important detail of focusing and depth of definition with different lenses see pages 11, 28–33 of THE PHOTO-MINIATURE No. 97.

It does this also in other circumstances when "depth" is equally shallow. Those who have copied small objects same size or nearly same size know that a considerable change in the distance between focusing screen and lens will not alter the focus much, but the slightest movement of the lens towards or away from the subject at once upsets the focus. In the same way, when using the hand-camera for objects at close quarters, such as bits of carving, inscriptions, etc., focusing by judgment

of distance is most uncertain; whereas the actual focusing by eye with the reflex is as easy as in any other case. So much for the power of accurate focusing supplied by the reflex. It should be plain that it makes easy both the use of lenses and work under conditions which would be impossible except with a stand camera.

Full-size Image

The advantage of a picture on the ground-glass the full size of that on the plate is obvious enough, but the chief merit of such a feature lies in the fact that this identity is preserved, however the lens-front is raised, lowered or swung. With practically every camera, hand or stand, other than a reflex, the finder fails to register correctly as soon as the lens is shifted from its central position. Arrangement of the subject then amounts to guess-work,—as in fact it often is when the front is not raised or swung, owing to the small size or incorrect construction of the "finder."

Minor Advantages

On the ground that any camera is better which gives the user less to think about, the reflex pattern deserves the credit for showing always by the picture on the ground-glass that the mirror is down and the lens is uncovered and in readiness to take a picture. No merit this, of particular instruments: it is inevitable in a reflex pattern. If not a positive advantage, it saves one from the error of making a snap with the lens capped, as happens sometimes with box or folding cameras where the finder is totally distinct from the lens proper.

Also some reflex workers have found that the brilliancy of the image on the ground-glass forms a reliable means of judging of the exposure required, as also of the massing of light and shade; in other words, the photographic quality of a subject. The latter is certainly much better judged than in any form of finder: whether the former is a method to be recommended will be doubted by many, the present writer included. A comparison of two cases will suffice to show the fallacy of going rigidly by the appearance on the ground glass, except with liberal allowance for special circumstances. The view of a window-casement scene taken from the back of a room will appear much brighter on

A Llama in the London Zoo

Showing the advantage of the reflex camera in obtaining focus and arrangement of life subjects at close quarters

A Street in Jena

An example of the use of the reflex camera in securing a good arrangement of foreground and lofty building by use of rising front

the screen (owing to the shade of the room where the operator is stationed) than when using the camera out-of-doors in the usual way, though the exposure required will be perhaps one hundred times. The completeness with which outside light is cut off at the mouth of the hood greatly affects the apparent brilliancy of the picture. Also, the eye becomes more sensitive the longer it is fixed upon the image on the ground glass. Though a worker accustomed to the method may derive some guidance from it, the beginner will be safer with a table of exposures or a meter.

Summary

Before passing to the drawbacks to the reflex camera, the foregoing narration of the positive advantages may be condensed into a few words:

I. Visible and certain focusing up to the moment of exposure—
 a. Even with large aperture lens.
 b. Even with long-focus lens.
 c. Even when very near the object.

II. Perfect and certain arrangement of subject on ground-glass even when rising front is used.

III. Check on blank exposures.

IV. Guide as to photographic quality of subject.

V. Guide as to exposure of plates.

VI. Full size image, right way up.

Disadvantages: Size

To set against these good things are, first the bulk, weight and cost of a reflex, through each of these is reducible within certain limits. As regards size, a reflex of quarter-plate (3¼ x 4¼) size will measure, say, 7 x 7 x 6 inches. Some models will save an inch or so somewhere, usually at the cost of extension or rise of front. Such a camera, as also the 4 x 5 size, which runs to 8½ x 7 x 6 inches, is a thing to be looked after when being carried, and a half-plate or 5 x 7 instrument is too huge altogether to be a companion on a day's outing. However, two patterns of folding reflex are made, the dimensions of which, when closed, are about that of the folding focal-plane camera. The two cameras, described later, are made in 4 x 5 size only.

Weight

In weight also there is a great range of choice. One quarter-plate instrument weighs, complete with lens, only two and one-half pounds. This is exceptional, the average weight is from four to five pounds without lens. Just as with any other camera, hand or stand, in the great majority of cases, one pays for a full range of movements, and for substantial and rigid construction in extra weight. As to cost, this may be anything between $30 (£6) to $175 (£35): the difference between instruments so differently priced lies, not so much in the fact that the results obtained with the most costly cannot be obtained with the cheaper, but in the certainty and speed with which they are produced. Thus the lower-priced instruments, which have usually a loose reversing back, instead of an attached rotating back, give more trouble in bringing out to double extension, or do not give ready access to the focusing screen, of which drawbacks a word is said later.

Viewing the Image

The drawback to the reflex of needing to be held at such a level that the eyes can look down the hood to view the image is certainly a drawback, but there are ways of getting over it. If it is wished to hold the camera at the level of the eye, a mirror may be provided just inside the hood, so placed that the reflection of the image on the ground-glass can be seen in it. Such a mirror is a fixture in the hood of the Graflex camera (Folmer & Schwing Division, Eastman Kodak Company), the hood of which is provided with a special aperture, to allow of the image being observed in this way. A separate alternative hood, containing a mirror, is made for use with the "Birdland" camera (Sanders & Co.) and a focusing magnifier also fitted. This device is specially fitted for the purposes of the naturalist photographer, who can thus stand or sit at the rear of the camera waiting for his subject to come into the field of view. A supplementary mirror is also made as a separate accessory, which is fitted into the mouth of the hood and allows the camera to be used not only at the eye level but higher still, the mirror being turned down a little as the camera is held higher in the hands. This separate

mirror, which is supplied by Marion & Co., folds flat when not in use against a plate serving to attach it to the hood, and is thus protected from damage.

But, even without the aid of a mirror in the camera, a very high point of view can be taken by holding the reflex upside down at arm's length between the upstretched hands, and looking up into the hood. It is not difficult to hold the camera rigid so, nor to focus while thus holding it. What needs more practice is to point the lens horizontally, and so get the subject straight on the plate. And another difficulty is that the rising front becomes a falling front, and therefore, as a rule, useless. Yet the plan is quite practical;—Some photographs made in this way are reproduced in this number, and the writer was recently told by a press photographer that a colleague with whom he went through a campaign made most of his exposures from horseback, with the reflex used in this way. It should, however, be noted that cameras in which the mirror is raised by hand, simultaneously with the actuating of the shutter, cannot be used inverted in this way unless a latch is provided to keep the mirror down (i. e., in the position in which it casts an image), when the camera is held upside down.

Conspicuous

Greater conspicuousness about exhausts the list of drawbacks to the reflex. The manner of focusing with eyes to the hood cannot fail to attract more notice than does the plain box or folding camera; but, making a virtue of necessity, the very conspicuousness of the reflex may be used to divert attention from the photographer's real movements. The means of doing this (an auxiliary mirror or prism on the lens) are best described later when dealing with special dodges in handling the reflex.

The Best Size

"Best" depends on what one is doing with the reflex. If used for press or illustration work, where prints are wanted of size for use without enlargement, the half-plate or 5 x 7 will be chosen despite its unwieldy bulk and weight. These latter prohibit much carrying about of the camera. The 4 x 5 size is still just about large enough for useful contact prints, and compares very

favorably with the half-plate in dimensions and weight; but if enlargement has to be done,—and it most likely will from 4 x 5 negatives,—there is really little advantage in selecting this size in preference to the 3¼ x 4¼ or 2½ x 3½ inches.

Though the 3¼ x 4¼-inch size is not much less in price, the cost of using is forty per cent less than the 5 x 7; and the size and weight follow the same ratio, whilst, if lantern slides are the aim of the tourist, either 3¼ x 4¼ or 2½ x 3½ inches will allow of a good proportion being made by contact.

The Small Reflex There is much to be said for 2½ x 3½-inch as a most desirable size for reflex work. Bulk is reduced to about 5 x 5 x 5 inches and weight (with lens) to 2½ pounds in the case of a fairly substantial pattern. A 2½ x 3½-inch negative, taken at the same angle as a quarter-plate, will enlarge if anything a little better than the latter on account of the greater "depth" of focus. This latter, it would seem, is held to be an objection to adopting the smaller size for a reflex: where depth is great, as it is with a 4- or 4½-inch lens, the manufacturer queries the need of a reflex to secure sharp pictures. The need is of course less, but is nevertheless considerable, with a lens at *f* 5.6 and *f* 4.5, and the need of certain arrangement of the subject on the focusing screen is greater. Another advantage of the 2½ x 3½ size is that it permits of lantern-slides being made by contact. Its cost, however, is very little less than the quarter-plate. The small reflexes at present available are fully dealt with in THE PHOTO-MINIATURE No. 97, and so need no further mention in this number.

Reflex Essentials We should now be in a position to judge whether the reflex is, or is not, the ideal in hand-cameras for which we have been searching. Assuming our verdict to be that it is, it is well to consider what are the movements essential or desirable in a reflex. It goes without saying that the essential feature of a reflex is the exact correspondence in focus between the ground-glass and the picture plane: The picture, as sharply focused at C (Fig. 1), must be fixed with equal sharpness on the plate at D, or the

camera is absolutely to be condemned. This is a matter of manufacturing and nothing else, and, as it is the first and usually the only test which a purchaser applies, it is inexcusable to find a camera deficient in this respect. And usually a reflector camera comes through this test quite satisfactorily.

Movements

In regard to the other movements of a reflex, it is largely a question of the provision of movements which have been regarded as of doubtful advantage on other types of hand-camera only because of the uncertainty of using them by guess. That is to say, we have put up with little rise or swing of front on a hand-camera, not because we did not want more, but because more carried with it a higher degree of doubt as to the subject being correctly obtained on the plate. We dispensed with longer extension because a long-focus lens meant added difficulties in focusing. With the certainty in these respects given by the reflex principle, it becomes incumbent on the maker to give good measure in the way of rise, swing or extension, otherwise one feels that one is being cheated out of the legitimate gain secured by a reflector camera. So that it is natural to ask for considerable rise of front in a reflex. A fair amount, and one given by a few makers, is one-quarter the height of the plate, that is one inch in the quarter-plate size. One-third would be better still, and this is given by at least one reflex. As regards the manner of raising the lens panel, the full-size image on the ground-glass can be arranged so exactly that an equally fine adjustment of the lens is called for. Those who have used a reflex with screw or rack-and-pinion adjustment will be loath to go back to one where the panel has to be pushed up and down in the old-fashioned way. Some makers put a cross-front movement in addition to the rise, even on the square-pattern reflex where it is of no use whatever.

Swing Back: Swing Front

Of all movements which a reflex can possess, the swing back is the most inadvisable and absurd, because it involves the inter-gearing of both the focusing screen and the back which carries the plate-holder. Under the present

conditions of manufacture, the swing back in a reflex is a commercial impossibility. It does not figure in a single camera. On the other hand, the swing front will do nearly everything which the swing back will accomplish, is easily embodied in a reflex camera and is a very advisable movement. One chief use of it is that it allows of a large aperture lens being used, say *f* 4.5, and both distance and foreground being obtained at the same time in sharp focus, owing to the fact that the swinging front puts a distance between the lens and the part of the plate where the foreground is brought to focus greater than that between the lens and the part where the distance is focused. Obviously, this means the ability to use a larger stop than could be employed were the front a fixture. The movement is of little use on a scale-focusing camera, but where the whole image can be seen and focused it is a very valuable aid. The swing front is provided on few of the commercial reflexes except as an extra. The front of the Royal Ruby reflex (Thornton Pickard Company) has its well-known swing movement. The Minex (Adams & Co.) is fitted with a very convenient square swing-front panel by which the lens is tilted up or down or sideways as desired (a four-ways swing), and in each case is automatically brought back into the normal "square" position.

Single and Double Extension

The wish to use a long-focus lens is not the only reason for selecting a double-extension reflex camera. Another is the power obtained for using the camera for copying or photographing objects at full scale or nearly full scale. For example, if some detail or inscription be photographed half-size with a five-inch lens, the distance from lens to plate must be 5 × 1.5 = 7½ inches. If the reduction is only to three-quarters, the extension necessary is nine inches. Such work (the focusing, etc.) is perfectly easy with a reflex which has the extension, and therefore the gain in having a camera which racks out to ten or twelve inches in the quarter-plate size is a double one. There are three methods of devising the extra extension: (1) Pulling out the front on its baseboard and locking it there, (2) racking out to the full length, and (3) securing the full extension

Inside the Castle Gate, Rothenburg, Bavaria

The reproduction shows the reflex negative up to the edges of the plate, the black border being due to the rebate of the plate holder. Example of the nicety of focusing with objects near to and remote from the camera, at an aperture large enough to give full exposure to dark foreground at shutter speed required for moving objects.

A Medieval Market Place

Showing the advantage of the reflex with rising front. A difference of an inch in the position of the lens would have prevented the outline of the Neptune figure being obtained (as here) against the

by an accessory lens tube or cone. The third method, on account of its slowness, is the worst; it takes so long that often it is thought too much trouble to try what the picture looks like with the long-focus lens. Of one (1) and two (2) the former entails less wear, is usually more rigid and is, if anything, a little quicker than two (2). Almost as important as the provision of the double extension of the camera is a convenient means of removing one-half of the lens if the single component is to be used, or of substituting a complete long-focus lens. When dividing a double lens it is a great convenience to have the front lens specially mounted so as to be instantly removable, and to have a place provided in the camera into which it can be quickly put away. One or two makers do this.

To sum up the value of the double extension,—it is necessary, when using the lens of normal focus for copying, etc., on a fairly large scale and when using a long-focus lens of really large aperture.

It is possible to dispense with the long extension and still use a long-focus lens, but this means the employment of a lens of the telephoto type, such as the Bis-Telar of Busch, the Adon of Dallmeyer, or the Tele of Zeiss which, however, work at such apertures as *f*/9 to *f*/12, and even then call for somewhat greater extension than is usually provided in some single-extension cameras, owing to the fact that they project into the camera. On the whole, the double extension is worth its extra cost and very slight extra bulk.

Short Focus Lenses

Before leaving the subject of extension, a word needs to be said as to the use of a lens of short focus. It will be evident that the fact of a mirror moving in the camera prevents a lens of very short focus being used. There must be room for the mirror to move, and with all cameras made with upward-moving mirrors that is so. Some of them cannot do with a lens less than six-inch focus; others will take a five-inch lens, and one or two can be used with a four and three-fourths or four and one-half-inch focus. These shorter foci are utilized by arranging matters so that the mirror, on being released from its "down" position, is first drawn back some-

what so that it gets past the back of the lens. This in-and-out dodging movement is one way in which the difficulty is got over, as in the Soho, Ross, and Beaufort cameras. Another maker, Newman and Guardia,—is making the mirror divided, a front strip about three-quarters of an inch wide being flexibly hinged to the main portion, so that, when the mirror rises, this part, instead of sticking out, hangs vertically and so misses the lens mount. In no case, however, does any standard make of reflex take a lens of such short focus as to be a wide angle; e. g., a four-inch lens cannot be used in the ordinary way in a 4 x 5-inch camera, which is not such a very wide angle after all. It is of course possible to have such a lens fitted in a deeply sunk mount so that it is brought near enough to the plate, but not for use in conjunction with the mirror. This latter would first have to be put into the "up" position and a pictured focused on a ground-glass placed at the back of the camera,—in short, the reflector method temporarily dispensed with. One way out of the difficulty has, however, been devised by Mr. A. L. Adams, whose very ingenious solution of the problem is as follows: Instead of hinging the mirror in the upper back part of the camera and causing it to move upward on release, it is hinged in the lower front part of the body and caused to move downward on the bed of the camera. With this system other means must be taken to cover the ground-glass prior to the exposure of the plate, and this is done in accordance with Mr. Adams' patent by means of a flexible blind which moves with the mirror. This is a quite practicable device, though necessarily more complicated than the usual pattern. Though it allows of very short-focus lenses being used, it is not listed as a stock pattern among the Adams Videx cameras.

Focusing Screen

Thus far we have dealt with movements which are recognized as necessary or useful in any hand-camera, our object having been to point out that each of them becomes doubly useful in the case of a reflex. Let us now consider the parts peculiar to a reflex. These we have deferred until now because they do not possess in them-

selves any positive advantages in hand-camera work, though they are essential to the effective use of a reflex. The focusing screen in almost every pattern of reflector camera is square like the back of the camera, and is marked to indicate the boundaries of the picture corresponding to an "upright" or "landscape" position of the rotating or reversing back. The most usual and common form of marking is that shown in Fig. 2. This simple means of showing the subject included on the plate is as effective as any other. One or two cameras are provided with a system of masking strips connected with the rotating back. When this latter is changed from, say, the "upright" to the "landscape" way of the plate, the mask, which is placed immediately under the focusing screen, is automatically altered in shape to correspond. This refinement is a further check on the misuse of the camera.

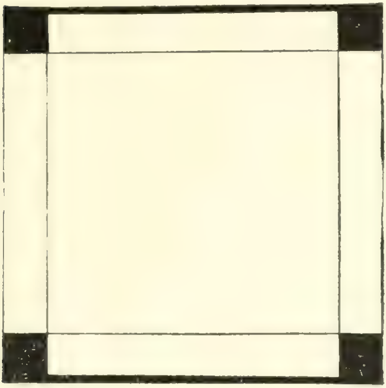


FIG. 2. Square focusing screen as marked for horizontal (landscape) and upright (figure) pictures corners: opaque black varnish applied to ground side of screen. Inner lines: pencil lines 1-16th of an inch in width.

Getting at the Screen

But what is most important is that the surface of the focusing screen should be instantly accessible that the hood should be removable to such an extent that the whole screen can be dusted or wiped. Sufficient importance does not seem to be attached to this point. Most makers dwell upon the advantage of ready accessibility of the mirror for dusting: but usually if the mirror be dusted when starting work for the day it will not require any further attention, whilst the focusing screen if it gets dusty or

wet in the day's work may require wiping several times, otherwise it is impossible to secure sharp focus. Most recent patterns of reflex cameras allow of this being done, and at the same time afford protection of the ground glass.

The Hood The best average height of hood when erected is eight to nine inches, in the quarter-plate size. This gives a comfortable angle of view for the eyes. The two important features of a hood are that it should be erected, or erect itself, rapidly, and should afford a clear view of all but the extreme corners of the square focusing screen. A hood that takes quite a little time to fix up and put down again is a nuisance; as a camera, with hood extended, attracts so much more notice than when the latter is closed, there is good reason for preferring a pattern of the latter which allows of the hood being rapidly brought into and put out of action.

The Mirror It may be thought that because the mirror of a reflex is used only as a means of focusing the image, there is no particular reason for having it flat and using its surface or silver side outward,—that is to say, in the position in which it is most readily tarnished or scratched. But it is necessary that the mirror be flat in order that a true, flat image may be cast by the lens on the focusing screen; and it is necessary that the reflection should take place from the silver surface, in order to ensure one single sharp reflected image. When using the mirror glass side outward, there are formed two separate reflected images, one from the silver surface and a second from the outer or front surface of the glass. These separate images cause a confused picture, and though the weaker image from the glass surface might not invariably prevent accurate focusing, it does so in many cases. A surface-silvered mirror may be taken as essential to a high-quality reflex.

As regards the important question of the mounting and release of the mirror and its gearing with the shutter, reflex cameras may be divided into two groups: In the first, the mirror is raised by a spring on the shutter release being operated, the mechanism releasing the

shutter when the mirror has reached the up position, where it remains until put down. In cameras of the second group, the mirror is raised not by a spring but by the operator's pressure on the release key. This latter, on being pressed, first causes the mirror to come into the up position and then, on further pressure, releases the shutter. On removal of the finger from the release key, the mirror falls. In the case of cameras of group No. 1 (spring-actuated mirrors), the mirror has to be put down by hand.

A little thought must be given to the merits and demerits of these two systems. It is certainly true that there is a twofold advantage in having the mirror come back into the down position. In the first place, it makes one adjustment the less. In the second, it completely safeguards the user from accidental re-exposure of the plate as a result of winding up the focal-plane shutter before putting down the mirror. On the other hand, it is not so gentle or so "regular" a method of release. The release is not so gentle because in the second or so immediately prior to the shutter opening one is pressing down the release key in order to raise the mirror, and this action militates against holding the camera in the most rigid way. When this method is adopted, the movement of the release key should be in a straight line towards the body, thus, not downward parallel with the body, thus, or through an angle, thus in which position the conditions are highly favorable to movement of the camera. In describing this form of release as less "regular," the reference is to the interval of time which elapses between the pressure on the release and the actual movement of the blind of the shutter. In the case of a spring-actuated mirror, this is always the same. In the case of the hand-raised mirror, the first part of the process—the raising of the mirror—may be involuntarily done much more quickly at one time than another. So much for the pros and cons of the second method, which, it may be said, is that of the cheaper cameras, although one or two makers of repute evidently consider it the preferable plan, apart from considerations of cost. A further though minor drawback to the

falling mirror system has been mentioned in an earlier paragraph when dealing with the use of the reflex upside down. When photographing over an obstruction, the falling mirror prevents this being done.

Coming back to the first system of the spring-actuated mirror, the advantage of gentle and "regular" release can be united with that of a check on the re-exposure of the plate in two ways: (1) by a gearing of shutter and mirror mechanism whereby the shutter winding key is locked while the mirror is up; (2) by making the focal-plane shutter self-capping,—that is, the slit is covered by an auxiliary blind as it travels up to the set position on being re-wound. The first of these methods is the older and is notably embodied in the Newman & Guardia Reflex. The second is well examplified in the present model of the Adams Videx camera. But the check on accidental exposure due to performing the two re-setting operations in the wrong order is not provided by all makers of spring-mirror camera. Some allow of the shutter's being wound but not of its being kept up. One may thus be apprised of the exposure of the plate as soon as the mischief has been done, which is better than no sign at all. On the other hand, at least one make of dropping-mirror camera, the Thornton-Pickard, is fitted with a self-capping focal-plane shutter, such a shutter rendering it unnecessary to provide a light-tight contact of the mirror carrier with the frame against which it rests when in the down position.

One refinement which should be mentioned in regard to the lever placed outside the camera for the adjustment of the spring-actuated mirror is that in one or two cameras its position — or \ indicates the position of the mirror itself in the camera. It is a convenience, in any case, and, with cameras unprovided with a locking or self-capping shutter, the next best preventive of inadvertent re-exposure.

The Shutter In this paragraph it is understood that only the focal-plane shutter is referred to. The few instances of other shutters fitted to reflexes are mentioned on a later page. Despite the great number of focal-plane shutters, there is not much difference between them as to the series of high

speeds: they nearly all go or claim to go to 1-1000 of a second. The differences between them, however, as to convenience of changing from one speed to another (an equally important point) are very great, and the ranges of low speeds, 1-20 of a second down to 1-10, 1-5 or still slower speeds (also a point of real practical importance), are equally diverse. The reader is the only one to decide whether he intends to use the speeds from 1-500 to 1-1000 of a second. If he does not, he had far better have the slit of his shutter widened, to begin with, so as to give still slower speeds than those usually provided. In a quarter-plate shutter, the slowest speed (not obtained by time or bulb adjustment) is usually 1-10 of a second. Speeds of 1-5 and $\frac{1}{2}$ of a second are often of great service, particularly with a reflex camera, the weight of which allows of its being held steady. For photographs of motor-car racing, jumping and all such feats of the focal-plane shutter, the high speeds are a necessity, but many a worker has used a camera provided with them without once turning the dial of the shutter beyond 1-250.

Far more useful than such extreme range of speed is the means of altering the speed of the shutter within a comparatively small range, quickly and easily and while the shutter is set. There is a great difference between the shutters of reflex cameras in this respect. It is here that some cheaper instruments show their deficiency. On most of these the shutter has to be released in order to alter the width of slit. The alternative method of modifying the speed is by altering the spring-tension, usually a rather awkward operation. The quickness with which the shutter speed may be turned from $\frac{1}{25}$ to $\frac{1}{10}$ or to $\frac{1}{50}$ and back again, almost without relaxing one's inspection of the image, is a point in which the more expensive instruments score.

Reflex with Lens Shutter

It will doubtless surprise many who have learned to consider the use of the focal-plane shutter as an essential feature of reflex cameras that a means has been devised whereby a between-lens shutter can be substituted for the focal-plane shutter in this type of camera. We refer to an invention to be placed on the market shortly by The Multi-Speed Shutter Company, New York.

Realizing that the cycle or folding hand camera is easier to carry along on tours and trips than the bulky reflex, and that a good many photographers like to make use of the reflecting principle when it is desirable, The Multi-Speed Shutter Company has designed a compartment which is added between camera and camera-back, thus allowing the photographer to work his instrument at will either as a reflecting camera or as a cycle camera. Further advantages of this idea are apparent. The present rack and pinion attachments in connection with the reflecting compartment will allow the use of single combination lenses or doublets of any focal length. The reflecting compartment contains all the mechanism for opening the shutter, for focusing, for lifting the mirror and for releasing the shutter, and the normal position is always set ready for an exposure. A pressure on the lever will cause the shutter to close, the mirror to lift, releasing the shutter on the last pressure. After exposure everything goes back to normal position automatically and the plate-holders only need to be turned.

Thus the Multi-Speed Shutter reflecting camera promises to be the quickest reset reflecting camera of them all. The makers' intention is to offer these compartments in 5 x 7 and 4 x 5 sizes, ready to be fitted to any cycle camera of this size; if the demand should warrant, they will later introduce a reflecting compartment for 3¼ x 5½-inch cameras with a square back.

The reflecting camera with a reliable between-lens shutter would have the advantage of doing away with distortion and sectional exposure, both long and short exposures being made over the whole plate at once. What this means in respect to slow exposures only the photographer who has worked a roller curtain in connection with the mirror knows. It is practically impossible to hold a reflecting camera with curtain shutter steady with lower speeds than 1-100 part of a second, as the total exposure consumes a much longer time, equivalent to nearly 1-10 of a second. With a between-lens shutter 1-10 of a second would mean the same effort in holding a camera quiet as 1-100 part of second with the present reflecting camera. As far as

instantaneous work is concerned this reflecting camera should be ahead because a quicker exposure can be made. We all know that a certain time elapses before the mirror is lifted out of the way, another moment is lost by releasing the focal-plane shutter, and another fraction of a second is lost till the slit passes over the moving object, resulting in getting an image that has a different position altogether than when originally seen on the ground glass. Really fast work such as baseball, golf and polo is, therefore, best attempted only in a diagonal direction if success is essential. How much easier this will be with the new camera can be easily seen; for the mirror has only to be lifted out of the way and then the exposure is made instantaneously over the whole plate at once.

Focusing Pinion and Shutter Release

With very few exceptions, it is the custom of reflex makers to put the shutter release and the focusing-pinion head on opposite sides of the camera, on the ground that this permits of the focusing pinion being manipulated up to the instant of exposure and the best focus thus secured of a rapidly moving object. It is doubtful if many persons are able to exercise the power thus afforded; but, in any case, the arrangement offers no obstacle to those who prefer to focus in a given spot and to wait for the moving object to come into focus. The point deserves to be mentioned because it is sometimes stated that the placing of the pinion head and the release both on the same side of the camera is unfavorable to the photographing of objects in rapid motion. Experience, however, shows that the system of preliminary focusing and the watching either of the actual object or its image on the focusing screen is very accurate and certain in its results. It may happen, too, that a camera with the two adjustments on the same side is more convenient. To instance one case: In making an exposure with the camera placed on the top of a wall, it was found impossible (owing to the height) to look down into the focusing screen, but the picture was obtained by laying the reflex on its side and looking horizontally into the hood. The fact of one side being free from projections allowed of both focusing and exposure being easily done while the camera was in this position.

Revolving or Reversing Back

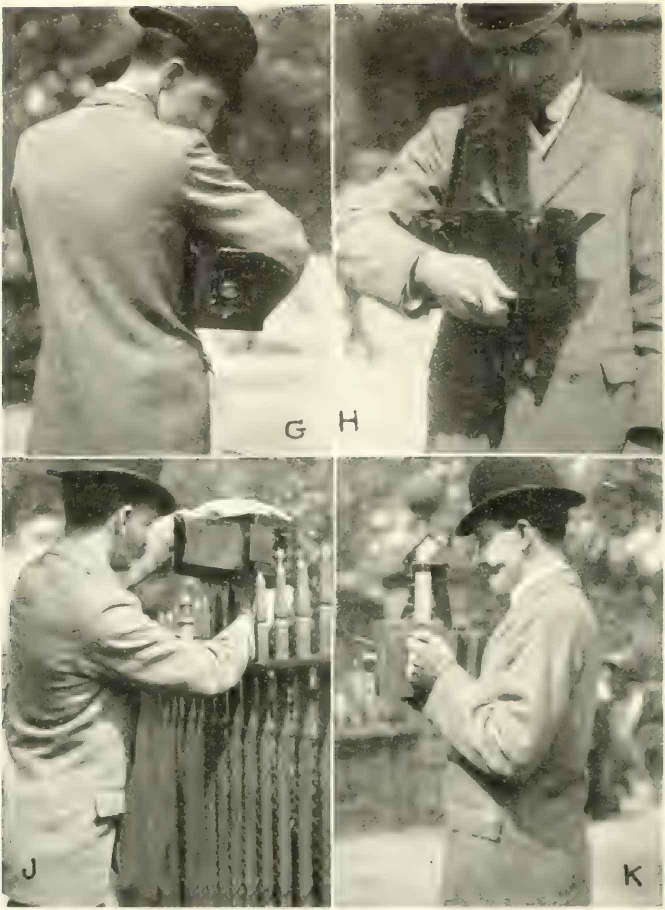
It has become usual to provide a reflex with an attached rotating or revolving back instead of a detachable reversing back, although one or two other (scale-focusing) cameras now have this convenient feature. The rotating back needs to be solidly built, and to be provided with spring catches which bring it to a stop with the plate in either the upright or landscape position. Some makers make the rotating back thin and build the shutter into the camera. Others make the shutter part of the rotating back. Though the point is a minor one, each plan has its advantages: but the preferable plan is to put the shutter in the camera because the space there allows of a quick-wind pattern being used, whereas, unless the back is made of ungainly proportions, the shutter has to be rather slow in the wind, space not allowing of the necessary size of gear wheels. True, the blind of the shutter can be put nearer the plate when the shutter is made one with the back, a gain in shutter "efficiency," and also the rotatable shutter should permit (though often it does not) of the duration of the travel of the slit being opposed to that of the movement of the image on the plate, a condition which favors the avoidance of distortion by the focal-plane shutter. But the real convenience of a rapid wind in the experience of the average worker should out-balance these somewhat problematical advantages.

Using the Reflex

The most attractive feature about a reflex is that, as soon as its few adjustments have been mastered, there is nothing more to learn before the camera can be taken out and used with good success. In photographing rapidly-moving subjects, such as motor cars, much practice in judging of the correct moment at which to expose is just as necessary with the reflex as with any other form of camera,—perhaps a little more so in the case of the reflex, because the "instantaneity" of release is not quite so rapid (granting, for the moment, degrees of "instantaneity") as it is with a camera in which there is only the one movement, the release of the shutter. In other words, the interval between the instant at

Spring Cleaning

An example of arrangement of picture by rapid glance into hood when using reflex camera at close quarters unknown to the subject



G. Showing the method of holding the reflex camera under the arm and pointing backwards.

H. Looking straight forward and taking the photograph sideways.

J. Laying the reflex on its side when working at the eye level. In this case it is an advantage to have focusing pinion and release on same side.

K. Camera held higher: picture on focusing screen seen in mirror at top.

which the release is pressed and that at which the exposure is made is a little longer in the case of the reflex. If this were the only interval which elapses between the act of deciding to make an exposure and the actual exposure itself, there might be a reason for putting the reflex second to other types of camera; but as those well know who have had experience in photographing events in which the exposure must be timed to a nicety in order to catch the subject, the photographer gets into the habit of pressing the release a little in anticipation of what he sees to be the right moment. This anticipation of the correct instant will be a little further in advance when using a reflex in place of a focal-plane camera of the Goerz-Anschütz type, but practice in this as in other operations becomes second nature, and it is hardly fair to accuse the reflex of being really "slower" (less prompt) than the ordinary folding focal-plane camera. At any rate, the photographer of such rapidly-moving objects, whatever type of camera he employs, will find the most certain method to be that of first focusing on the spot to which the moving object will come, and then to wait his chance with his eyes fixed on the actual scene itself, not upon the image on the ground-glass. In doing this he has the advantage, in the case of a reflex, of being able to focus with great exactness in the first instance and, further, of judging on the ground-glass the size which his runner or motor car will be in the actual negative.

Disguising the Reflex

As has been said, the reflex is undeniably more conspicuous than an ordinary box camera, and, therefore, less suitable for making photographs in streets or elsewhere when it is desired to secure figures free from the bland smile of interest which persons usually bestow upon the photographer when they discover themselves to be the subject of his attentions. But there are one or two little dodges, peculiar to the reflex, by which it may be used in a very unobtrusive way. Perhaps the simplest is to stand with the back to the subject and, pushing the reflex through the short tunnel made by one arm, inspect the subject on the ground-glass, where it will be seen as plainly as usual but, of course, in an inverted

position. A somewhat similar plan, which is perhaps a little easier, is to hold the reflex in the ordinary way but to point it sideways, observing the picture on the ground-glass through the narrow way of the mouth of the hood. For this dodge to be really successful, the lens should be sunk flush with the camera, as in the illustration of the use of the method. The fact of the side of the camera pointed toward them being free from projection helps the suggestion that the photographer's operations are in another direction. A third and most effective method of thus drawing away attention from the photographer's actual operations consists in the use of a second mirror placed in front of the lens at an angle of 45° to the axis of the latter. This principle of photographing sideways, while the lens of the camera is in reality pointing straight in front, is one which has been embodied in hand-cameras on several occasions, but is more simply applied to a reflex than to any other. The mirror requires to be of the best optically flat glass silver-surfaced, since in this instance the actual image on the plate is formed by the mirror, and any inequalities will impair the definition of the lens. The mirror is mounted in a tube, which is best made circular and attached to the tube of the lens so as to appear a prolongation of it. The more conspicuous the whole fitting looks, the better for the purpose of disarming the suspicions of the persons who are being photographed, since the lens is pointed straight forward, while the picture is taken in the direction looking right or left at a right angle. The only drawback to this plan is that the mirror surface is very liable to get damaged or tarnished and may require frequent resilvering. If a permanent metal mirror could be produced at a moderate price, this accessory would, doubtless, be much more used on a reflex than it is at present. But a metal mirror of about the only kind on the market (the Kahlbaum) costs about $30 (£6) in size sufficient for a seven-inch lens of $f/4.5$ aperture, and is very heavy, into the bargain. The only alternative is a prism which is no less costly and bulky. The best plan in fitting such an accessory as this to a reflex is to have an optically worked glass surface-silvered and mounted

in a tube or box provided with a door which can be kept closed except when the photograph is being taken. The negatives made in this way are, of course, reversed as regards right and left, and need to be turned the film side to the light when making enlargements from them or wherever accuracy is desirable..

Working at Abnormal Level

It is not once in twenty times that any drawback attaches to the need of holding the reflex on a level with the waist; but when exposures have to be made over a fence or wall, or when the nature of the subject renders it advisable to take the highest position possible, the reflex is certainly not quite so convenient as certain other types of camera, although it *will* do what is impossible with any other type of hand-camera. However, there are one or two dodges which will often provide a way out of the difficulty. If a support at a good height can be found for the camera, as simple a plan as any is to lay the instrument on one side and inspect the ground-glass, as shown in the illustration on page 124 J. As pointed out in a previous paragraph, it is an advantage when using the camera in this way to have both the focusing pinion and the release on the same side of the camera, this side being placed uppermost and allowing of the ready making of these adjustments.

Where no support is available, a method which is quite practicable after a little practice is to hold the camera in an inverted position at arm's length directly above the head, and view the picture by looking up into the hood. As both hands are required to hold the camera steady, focusing is not an easy operation; the camera should be provided with a stout carrying strap, affixed so that one hand can hold it aloft whilst focusing is being done. The most troublesome thing is the making certain of the camera being pointed level. This method allows of a higher viewpoint than that with any other hand-camera, giving equal certainty of picture.

An Accessory Mirror

Still another device, which has the merit of being less conspicuous than the last mentioned, though in other respects it is not so satisfactory, is to provide an accessory mirror in the hood or placed at an angle at the mouth of the

hood. The camera being held on a level with the eyes, the reflection of the image on the ground-glass screen can be seen in this accessory mirror. The hood of the Graflex is permanently fitted with a mirror for this purpose, having part of the hood cut away so as to allow of the image being seen in the mirror. A separate mirror, for attachment to the hood of almost any reflex, is sold by Marion & Co. It is hinged to the stem or plate by which it is affixed to the reflex, so that it can be adjusted to the angle necessary for the observation of the image at different heights of the camera. Even under the best conditions, the mirror does not show the whole picture on the screen, and therefore leaves something to guess work, but it is a useful guide when no better is available. The image can, of course, be focused whilst being observed in the mirror; but unless the latter is surface-silvered one cannot rely on getting perfectly sharp definition, owing to reflection from the two surfaces of a back-silvered mirror. Despite these drawbacks, the supplementary mirror is a useful device, at times, and should not be overlooked.

Choosing a Reflex

The reader who has studied the foregoing paragraphs will, it is hoped, be in a position to judge of the movements which a reflex suitable for his particular purposes should possess. In obtaining these by the purchase of one or other of the many reflector cameras on the market, his difficulties may be said both to begin and end. There are, at a moderate estimate, five and twenty distinct patterns of reflex camera on the American and British markets, and, as is the way of manufacturers, each extols his own instrument. It should be clear from what has already been said that certain movements of a reflex are of great, and others of small importance; also, that one way of attaining an end is better than another. A reference to the earlier portion of this monograph should therefore enable any one unable to examine all cameras for himself to form an opinion on their respective merits. As in the choice of other apparatus, it is difficult to say that there is a best,—still more so, to place the articles in an order of merit. A movement which may be regarded by a maker as valuable, and is so in many

Window Flower Boxes in Berkley Square, London

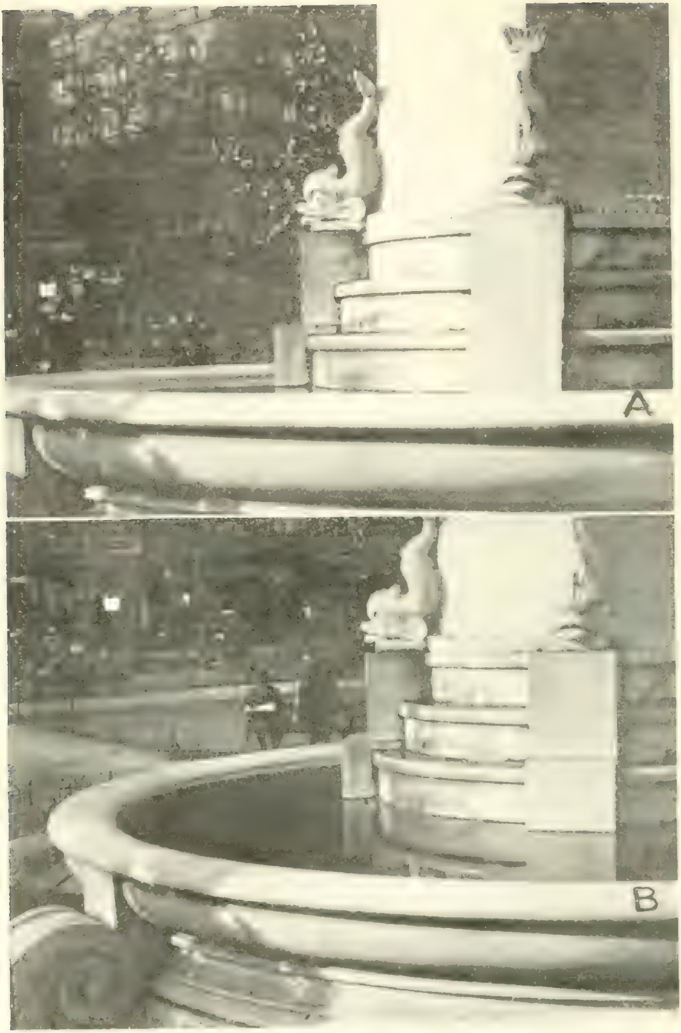
C. The best view of the flowers obtainable with the camera held as in *D.*

D. The position of the camera when making the photograph *C.*

E. The obstruction of the railings is surmounted by holding the camera at arm's length above the head.

F. The position thus taken in making the second photograph (*F*) is here shown.

The photographs illustrate the possibilities of securing views with a reflex in circumstances in which any other type of hand camera would be useless.



Fountain in Leicester Square, London

A. Photographed with the reflex held level with the waist.

B. Photographed with the reflex held upside down at arm's length above the head. The higher point of view, some two feet above the eyes, enables the water in the basin and the surrounding garden to be plainly seen.

cases, may not be of much use to another worker. Nevertheless, a first rough classification of reflex instruments may be made into three very unequal groups: Group No. I contains only one camera, the Premograph (Rochester Optical Division, Eastman Kodak Company), which occupies a place by itself as being a non-focal-plane camera of a simple yet efficient type, sold at the low price of $10 (£2). The Premograph is the simplest embodiment of the reflex principle, and although it does not claim to possess the range of movements of the more costly cameras, it allows of the certainty as regards focus and arrangement which is the essential advantage of any reflex. In Group II may be placed the majority of the reflexes commercially obtainable at a price (in the quarter-plate size and with three double plate-holders, but without lens) at from $30 to $75 (£6 to £15). Lastly, in Group III must be placed the one or two cameras which in design, manufacture and range of movements, represent a specially high order of instrument. The two chief cameras in this group are those made by the firms of Adams & Co., and Newman & Guardia, Ltd., both of whom have constructed and advocated the reflex type of instrument, while other makers either had not realized the advantages of the reflex, or had not produced a highly efficient pattern of camera. These cameras represent the high-water mark in reflex construction and, it may be added, of price; yet the features of these higher-priced cameras are not merely luxuries of debatable, practical value. Their special adjustments conduce to more rapid and to more certain working in a greater variety of conditions, and it may be said that, on these accounts, the price asked for them is not out of proportion to the facilities and range of efficiency provided.

The Premograph In this camera a mirror is used to give a full-size quarter-plate image, and at the same time is caused to form the shutter. Premograph No 1 is of the "fixed-focus" type, and the mirror serves simply as a full-size finder; but in Premograph No 2 a lens of larger aperture is used, and focusing is provided for. However, the fixed-focus pattern is a most efficient camera and, where conditions

of light allow of full exposure with a lens working at about f 14, will give results comparable with those of the more expensive reflexes. The shutter is composed of a pair of jaws, one of which, the upper, is the mirror; the other is a light metal plate which makes a light-tight junction with the mirror plate. When set for instantaneous exposures, this unique shutter is everset and gives an exposure which would seem to be about 1/30 of a second. A separate adjustment allows of time exposures. The camera carries the Premo filmpack with a capacity of twelve exposures. Premograph No 2 is fitted with a Bausch & Lomb R. R. lens, f/8 and gives a range of instantaneous speeds of 1-100, 1-25, 1-5 and 1/2 second, in addition to "time." The head of the focusing pinion is sunk into the camera, but springs out for use on touching a catch. The act of focusing, likewise, removes a spring dust cap from the lens, which in the normal way is thus protected.

Group II In describing the cameras which come under group II, it would be impossible to enter in detail upon the movements which each instrument possesses. The differences in prices are not great, a matter of $25 (£5) between the cheapest and most costly,—leaving out of consideration, for the moment, the still more expensive instruments just referred to. This difference in price, in the majority of cases, is accounted for by the movements provided; in other words, it represents value for money. The cameras differ as regards the facilities they give in the matter of extension, rise of front, adjustment of shutter, revolving or detachable reversing back and, lastly, method of release,—the choice here being between what we may call the "hand" or "lever" method (in which the operator himself raises the mirror, thereby releasing the shutter) and that in which the mirror is raised for him by a spring which automatically releases the shutter. In the first case, the mirror of itself falls into the "down" position again; in the second, it remains up, and has to be put down before making the next exposure. The respective merits of these two systems have already been dealt with, and we may therefore now give the abridged specifications of every reflex coming in this group at

present available in the American and British markets. In this brief survey we will take the $3\frac{1}{4} \times 4\frac{1}{4}$ (quarter-plate) size as representative. Where the price is given in dollars only, this indicates that the instrument is of American manufacture; when given in English money, that the camera is of British origin and, usually, obtainable only in that market.

Borsum Long-Focus (Borsum Camera Company.) Price (4 x 5 size), $100. *Shutter release*, by lever which raises mirror, the latter falling after exposure. Mirror is locked while in down or set position (to keep in place when upside down), and is automatically unlocked when actuating release. *Shutter*, quick-wind (about half-turn): speeds by altering tension and width of slit, the latter after shutter is released. *Shortest focus-lens* eight inches. *Longest camera extension*, twenty-three inches. Reversing back.

Ralli (W. Butcher & Sons, Ltd.) Price ($3\frac{1}{4} \times 4\frac{1}{4}$ size), £8 8s. *Shutter-release*, lever which raises mirror, the latter by falling after exposure. *Shutter* speeds by altering tension and width of slit, the latter with shutter partly set. *Longest camera extension* thirteen inches; reversible lens box used. Rotating back. *Rising front*, sliding panel. *Hood*, square bellows pattern supported by lazy-tongs, hinged at base to give access to focusing screen.

Planex (City Sale and Exchange.) Price ($3\frac{1}{4} \times 4\frac{1}{4}$ size), £10 10s. *Shutter-release*, by raising mirror which falls again after exposure, except when set to remain open after exposure. *Shutter*, alteration of speeds by both tension and width of slit (the latter whilst the shutter is half set). *Shortest focus lens*, six inches. *Longest camera extension*, twelve and three-fourth inches, obtained by racking to full and reversing lens-panel so that sunk-mount projects. *Rotating back. Rising front*, with rack and pinion adjustment. *Hood*, removable, giving access to focusing screen.

Hall (Hall Camera Company.) Price (4 x 5 size), $30. *Shutter-release*, by button pressure, direct action mirror (raised by spring), remaining up. *Shutter*, speeds by altering ten-

sion and width of slit which is adjustable from outside of camera; works directly in front of plate; quick-wind. *Shortest focus lens*, five and one-half inches. *Longest camera extension*, twelve inches. Camera built to take pictures landscape-way of the plate. *Rising front*, apparently none. *Hood*, self-adjusting, giving access to ground-glass and mirror. Camera wholly made of metal.

Auto-Graflex (Folmer & Schwing Div. E. K. Co.) Price ($3\frac{1}{4} \times 4\frac{1}{4}$ size), \$60 (£12 10s). Made in three sizes. *Shutter-release*, direct action, the mirror being raised by spring, releasing shutter and remaining up. *Shutter* of special pattern, having blind with five slits (one the full aperture of plate). Half turn of key resets any given slit, or all five from smallest to widest can be used in succession without rewinding. For a given slit, exposure can be shortened down to one-sixth speed by altering tension of spring. This can be done while shutter is set; for alteration of slit, mirror must be down. *Shortest focus lens*, five and one-half inches. *Longest camera extension*, seven inches; built horizontal for pictures landscape-way of plate. *Hood*, of special pattern, viewing aperture being so placed that the operator can see screen and also look into small mirror wherein the reflection of image on screen can be seen. This device allows of camera being held on a level with the eyes.

Revolving-back Auto-Graflex This model is built square for both upright and horizontal pictures, and has double extension and hood of ordinary pattern. Made in 4 x 5 size only. The "Press" Graflex, made in 5 x 7 size only, takes lenses from seven and one-half to fourteen inches focus and has a lens-panel for large anastigmats. The "Naturalists' Graflex" is of extra-long extension, taking lenses from twelve and three-fourth to twenty-six inches. It is provided with a second mirror (on the Auto-Graflex principle), so that the operator can stand concealed behind the camera to focus, but the focusing-hood swings up for use in the ordinary way. A description of the new 1 A Graflex was given in THE PHOTO-MINIATURE No. 97.

Plano-Reflex (Lancaster & Son, Ltd.) Price ($3\frac{1}{4}$ x $4\frac{1}{4}$ size), £8 17s 6d. *Shutter-release*, by raising mirror which falls after exposure. *Shutter*, speeds by alteration of both tension and slit, the latter while shutter is partly set. *Shortest focus lens*, six and one-half inches. *Longest camera extension*, twelve and one-half inches, by racking to full and pulling out baseboard. *Rotating back*, with automatic mask for focusing screen, showing picture landscape or upright. *Rising front*, by sliding panel. *Hood*, square when erected; turns back to lay bare screen.

Challenge de Luxe (J. Lizars.) Price, £12. *Shutter-release*, direct action, the mirror being raised by spring, releasing shutter and remaining up. *Shutter, of quick-wind*, speeds by altering tension and width of slit, the latter after exposure. *Shortest focus lens*, six inches. *Longest camera extension*, nine and one-quarter inches. Rotating back. *Rising front*, with rack-and-pinion movement. *Hood*, hinged for access to ground-glass.

Miral, Long Extension (F. V. K. Lloyd, Ltd.) Price ($3\frac{1}{4}$ x $4\frac{1}{4}$ size), £15 15s. *Shutter-release*, direct action, mirror (actuated by spring) remaining up. *Shutter*, speeds by altering tension and width of slit, the latter before setting shutter. *Shortest focus lens*, six inches. *Longest camera extension*, sufficient for half-lens of doublet. Rotating back. *Rising front*, in sliding recessed panel. *Hood*, hinged to back, giving access to ground-glass, which latter is also hinged, giving access to mirror. The advantages offered by this double convenience have been explained on an earlier page.

Soho (Marion & Co. Ltd.) Price ($3\frac{1}{4}$ x $4\frac{1}{4}$ size), £12. Made in several sizes. *Shutter-release*, direct action, mirror (raised by spring) remaining up. *Shutter*, speeds by alteration of width of slit (actual speeds being indicated on a dial) while shutter is partly set. *Shortest focus lens*, four and one-half inches. *Longest camera extension*, ten and one-quarter inches by direct rack and pinion. Rotating back. *Rising front*, with rack and lever adjustment. *Hood*, hinged for access to screen. The Soho Dainty Reflex is described in THE PHOTO-MINIATURE No. 97.

Birdland, Reversing Back (Sanders & Co.) Price ($3\frac{1}{4} \times 4\frac{1}{4}$ size), £18 17s. (Specially designed for natural history photographers.) *Shutter-release*, direct action, spring-actuated mirror which remains up. *Shutter*, Goerz-Anschütz focal-plane. *Shortest focus lens*, eight and one-quarter inches. *Longest camera extension*, twenty-two inches, obtained by additional pull-out baseboard. Reversing back. *Rising front*, in sliding panel. *Hood* is made in three patterns: (1) Ordinary collapsible, for viewing image from above camera. (2) With second mirror attached, for viewing image horizontally from back of camera. (3) A folding model of No. 2 with telescopic magnifier.

Shew (J. F. Shew & Co.) Price ($3\frac{1}{4} \times 4\frac{1}{4}$ size), £11 11s. *Shutter-release*, by lever which raises mirror, the latter falling after exposure. *Shutter*, Goerz-Anschütz. *Shortest extension*, five and three-eighths inches from lens cell to focusing screen or plate. *Longest camera extension*, eleven and three-quarters inches. Reversing back. *Rising front*, sliding; also swing front. *Hood*, hinged for access to focusing screen.

Sickle (O. Sichel & Co.) Price ($3\frac{1}{4} \times 4\frac{1}{4}$ size), £10. Made in several sizes. *Shutter-release*, by raising mirror which falls after exposure. *Shutter*, speeds by alteration of both tension and slit, the latter while shutter is partly set. *Shortest focus lens*, six inches. *Longest camera extension*, nine and one-half inches, by directly racking out. Rotating back. *Rising front*, by sliding-lens panel. *Hood*, hinged by its frame to camera top and thus giving access to screen.

Royal (A. E. Staley & Co.) Price ($3\frac{1}{4} \times 4\frac{1}{4}$ size), £9 9s. Made in three sizes. *Shutter-release*, by raising mirror, which falls again after exposure. *Shutter*, alteration of speeds by both tension of spring and width of slit (the latter after shutter has been released). *Shortest focus lens*, seven inches. *Longest camera extension*, eleven inches, by means of pull-out baseboard. *Rotating back*, with which is geared a mask under the focusing screen showing image corresponding with position of plate. *Rising*

front, push movement and set screw (ordinary pattern); also cross front. *Hood*, square and hinged by its frame to camera top, giving access to screen.

(Thornton-Pickard Mfg. Co., Ltd.)

Ruby Price ($3\frac{1}{4} \times 4\frac{1}{4}$ size), £7. *Shutter-release*, by lever which raises mirror, the latter falling after exposure. *Shutter*, special self-capping pattern; quick wind, (half-turn of key); adjustment of speeds by winding key alone while shutter is set or after release, actual speeds being indicated on dial. *Shortest focus lens*, five and one-half inches. *Longest camera extension*, about nine inches. Reversing back. Rising and falling front in sliding panel. *Hood*, removable for access to screen.

(Thornton-Pickard Mfg. Co., Ltd.)

Royal Ruby Price ($3\frac{1}{4} \times 4\frac{1}{4}$ size), £10 10s. *Shutter-release*, direct action, spring-actuated mirror which remains up after exposure. *Shutter*, speeds by alteration of tension and slit; locking device for preventing shutter from being re-wound before mirror has been set. This device can be put out of action when required, e. g., when using a focusing screen at back of camera. *Shortest focus lens*, five and one-half inches. *Longest camera extension*, fifteen inches, obtained by racking out front on baseboard and further extending it on cantilever struts. Rotating back. *Rising, falling and swing front*, of great range of movement as fitted to other Thornton-Pickard cameras. The camera is built with a dropping baseboard on which front is racked out except for the most distant objects. Rise, fall and swing of lens cover extremely wide range. *Hood*, detachable for getting at focusing screen.

(Turner, Son & Hope.) Price ($3\frac{1}{4}$

Beaufort $\times 4\frac{1}{4}$ size), £9 9s. *Shutter-release*, by raising lever which raises mirror, the latter falling after exposure. *Shutter*, of special pattern, self-capping so that plate is doubly covered when shutter is reset: Quick wind (half turn of key): Adjustment of speeds by winding key alone while shutter is set or after release, actual speeds being indicated on a dial. *Shortest focus lens*, four and one-half inches. *Longest camera extension*, thirteen inches, obtained by pulling

out auxiliary pair of metal extension struts. Rotating back. *Rising front*, actuated by rack and pinion. *Hood*, bellows pattern attached to hinged top of camera by two pairs of struts; base of hood is hinged to camera, giving access to screen.

Voigtländer (Voigtländer & Sohn) Price ($3\frac{1}{4}$ x $4\frac{1}{4}$ size) £20 16s. Made in several sizes. *Shutter-release*, direct action, mirror (raised by spring) remaining up. *Shutter*, speeds by altering both tension and width of slit. *Shortest focus lens*, $7\frac{1}{4}$ inches (except by special fitting). *Longest camera extension*, $10\frac{1}{2}$ inches. Rotating back. *Rising front* in sliding panel. *Hood*, giving access to ground-glass.

"Argus" Square Pattern (W. Watson & Sons, Ltd.) Price ($3\frac{1}{4}$ x $4\frac{1}{4}$ size) £11 10s. *Shutter-release*, by lever which raises mirror. *Shutter*, speeds by altering both tension and width of slit, the latter while shutter is partly set. *Shortest focus lens*, six and one-half inches. *Longest camera extension*, eleven inches, by rack and pinion throughout. Rotating back. *Rising front*—sliding lens panel. *Hood*, hinged for access to screen.

Ernemann (Chas. Zimmermann & Co., Ltd.) Price, ($3\frac{1}{4}$ x $4\frac{1}{4}$ size), £14. *Shutter-release*, direct action, spring-actuated mirror which remains up after exposure. *Shutter*, speeds by altering both tension and width of slit, the latter while shutter is partly set. *Shortest focus lens*, four and three-fourth inches. *Longest camera extension*, seven and one-half inches, by rack and pinion. Reversing back. *Rising front*, one and one-fourth inches with rack and pinion adjustment. *Hood*, screwed to camera top.

Adams Minex The Adams cameras are the Videx which has been out several years, and the Minex just issued (June 1909) which is a later form of the Videx. Both of these cameras require for a description of their many admirable features much greater space than is possible in these pages. The maker's catalogue supplies a very complete and accurate description, but we must here mention the salient feature in justification of our claim for these instruments that they are worth what they cost. Taking

An Ancient Bavarian Stronghold

An example of placing the subject on the plate when the front is raised to full extent

the Minex first, the quarter-plate instrument measures only about 7 x 5½ x 6½ inches over all, yet gives an extension by direct racking out of twelve and one-half inches and allows of there being carried in the camera an extra focusing screen, for use at the back, and three double plate-holders. So much for portability. In the matter of rise and fall of front (actuated by rack and pinion) the camera is exceptionally well provided, and has in addition a swing front built square and reversible in its mounting, so that the lens can be tilted not only upward or downward but also sideways, in all of which cases the screw adjustment of the swing movement also registers the lens squarely to the plate, when required. In its shutter the Minex represents refinements which make for speed and certainty to an extent which would seem to be incapable of further improvement. The shutter is self-capping, is of quick wind (about three-quarters of a turn) and, more than this the winding of the shutter also sets the mirror in the camera, there being only this one movement after each exposure.

Further than this, the alteration in speed can be made before or after exposure equally well, the speed to which the shutter is set remains fixed until it is set to another, and is seen on the dial whether the shutter be set or down. Also, one single movement is needed to set the shutter to or from "time." The range of instantaneous exposures is from 1-1000 to 3 seconds, and a single release serves for the shutter at all speeds. These advantages, it will be seen, are of real practical value, and render the camera, despite its wide range of movements, as simple in manipulation as an inexpensive box-camera. Other features of the Minex are the substantial revolving back and the mask adjusted with it, by which the shape of the picture being taken is shown on the focusing screen, still another check on working. Also, though of long focus, the Minex will take lenses down to four and one-half inches focal length, and mention should lastly be made of the deep, compact and self-erecting hood which is seen at its best on the Adams cameras. The price of the Minex, with three double plate-holders, without lens and with four-way swing front, is £28 5s. (about $140).

Adams Videx

Though the Minex represents the latest design of the Adams reflex cameras, its immediate predecessor, the Videx, deserves to be ranked with it as an instrument of special range of movements. Here, again, the full specification in the maker's list requires to be consulted. Two models of the Videx are listed, the Popular at £15 15s. and the De Luxe at £27, in each case 3¼ x 4¼ size, with three plate-holders. It would seem that the Minex takes the place of the De Luxe Videx.

N. and G. Reflex

The cameras of Newman and Guardia are so justly celebrated that the sign "N and G" has come to be synonymous with the highest quality. In the N. and G. Reflex the S. R. or square reflector pattern, which is the one for general and tourist purposes, the predominant note is reliability and strength (though not weight) even at the sacrifice of the most rapid manipulation. This reflex is notable for its absence of projections, when closed for carrying, even the winding key of the shutter being so placed that it cannot be damaged by an accidental blow. The camera is of double extension, the pull-out movement being a very rapid one and leaving the front attached to the baseboard by a rigid aluminum angle piece. A very convenient screw adjustment actuates the rise of front, which is one-quarter the height of the plate. The lens fitted to the N. and G. is the Zeiss Protar, specially mounted, so that when using the back combination alone as a single lens of nine and one-half inches focus (in the quarter-plate size), all that is necessary is to slip out the front glass from a bayonet joint and put it for the time in a compartment provided in the camera. In the matter of mounting of the shutter, the makers include the shutter as part of the rotating back, which enables them to place the dial of speeds where it is most conveniently seen. The shutter is made to work at one tension only, the adjustments of speed being made by simply altering the width of the slit, which is done while shutter is set, by turning the winding key,—further, for the more rapid speeds, or back again, if it is wished to use a lower speed after shutter has been wound to a higher. The shutter is

geared with the mirror levers, so that, after an exposure, the winding key is locked until the mirror has been raised. The same locking device prevents the rotating back being moved while the mirror is up. As regards all these movements, a mere verbal description cannot convey the excellent workmanship and smoothness of working provided in the N. and G. instruments, whilst in the matter of actual correspondence between actual and marked speeds of shutters during a long period of use, the makers are second to none. It should be added that in the latest model of their reflex Newman and Guardia have made two modifications. They have provided two separate shutter releases, one on each side of the camera, and have thus satisfied all preferences in this respect, and they have replaced the strut-support and wooden-topped hood by one of the self-erecting pattern fitting more comfortably to the eyes. The hood still gives immediate access to the screen. In the quarter-plate size, with three double plate-holders, but without lens, the price of the N. and G. reflex is £27 10s. (about $137).

Folding Reflexes

The aims of makers to provide the facilities of the reflex in a more compact form have led to the introduction of four patterns of collapsible reflex cameras, the bulk of which, when folded for carrying, is not very much more than that of a folding focal-plane instrument such as the Goerz-Anschütz. The first of these to appear on the market is the Giorno, so far as can be ascertained, manufactured only in France by the firm of Hemdé, Hem (Nord). The Giorno is a camera of fairly long extension, allowing of lenses up to eight inches focus in the 9 x 12-cm. size. This is secured by a rather small front bellows which is racked forward when the camera has been opened. Two movements are necessary for this latter operation, one to fix the extension struts at right angles to the back and another to erect the hood.

The next folding reflex to appear was the Houghton (Houghtons Ltd.), in which focusing is done with a lens in a focusing mount of the usual pattern. The front board of the camera allows of a one-inch rise of lens. The front is extended on two pairs of struts, after the

manner of a focal-plane camera, after which the hood is attached to two leather-covered struts and the mirror put down ready for an exposure. In the quarter-plate, the only size made, with a rotating back, three double slides but without lens, the price of the "Houghton" is £18 (about $90).

The Goerz folding reflex, the next in historical order, is made in a 4 x 5 size only and measures, when closed, 7¾ x 7 x 3⅝ inches. The body of the camera is formed by the Goerz-Anschütz focal-plane shutter mounted in a wooden framework to which are attacked two rigid arms which hold the front of the camera. In the closed position these arms run parallel with the back frame and hold the lens pointing downward when carried by the strap. The movement for opening the camera consists only in grasping the lens and moving it up with a semicircular motion until it stops, which action also depresses the mirror ready for use. The focusing screen is very rigidly supported in a metal frame, and the instrument is quite equal in every respect to the other Goerz cameras.

The fourth folding reflex is that made by Goltz and Breutmann, Dresden, A. Germany. They retain the ordinary pattern of body, but provide a movement whereby both mirror and hood, when not in use, are held inside the body of the camera. A few turns of a pinion, similar to that used for focusing, bring the mirror and hood into position. The saving in bulk, when the camera is "folded" for carrying, amounts to about three inches, the total outside dimensions of the 9 x 12-cm. size being 12 x 16½ x 18 cm. (4¾ x 6½ x 7¼ inches.)

Great as are the advantages of portability, it is doubtful if they are worth the price paid for them in reflector cameras of the folding type. To secure this portability, sacrifice has to be made of such aids to practical work as long extension, instant readiness of the camera for use, and the ability to use a lens of short focus.

Full-size Image: no Mirror

One last paragraph must be devoted to a method which has been the subject of several patents of late years, viz., the substitution for the mirror of an opaque white surface on which the image is viewed and focused. Apparently the only camera in which this

system has been given commercial shape is that of the Hales Camera Company, Ridgewood, New Jersey. In this instrument the image is cast upon the white (front) surface of the blind or curtain of the focal-plane shutter, being viewed thereon from an eye-piece. On the shutter-release being pressed, the back frame of the camera automatically comes forward the small distance necessary to bring the plate into the position of the focused image. The "Hales" camera is built with a falling baseboard on which the lens front is racked out.

Working with a Reflex

The information here for the first time gathered together concerning the reflex camera in principles and construction sufficiently shows the advantages and disadvantages of this type of instrument. Properly understood and intelligently handled, there can be no doubt but that the reflex camera is the most efficient and most satisfactory of cameras, offering the widest range of capacity and the greatest amount of certainty in results. To get the best out of any individual camera, the first need is a practical knowledge of the particular model chosen for personal use. After that, familiarity with the technical conditions of different classes of photography will quickly enable the reader to make the most of his reflex.

[The illustrations in this issue were made with various reflex cameras by the writer of the monograph, who asks that his work shall be published anonymously. Editor.]

BOOKS

Focal-Plane Photography. THE PHOTO-MINIATURE No. 77. 25 cents.

Photographing Outdoor Sports. THE PHOTO-MINIATURE No. 91. 25 cents.

Photography with Small Cameras. THE PHOTO-MINIATURE No. 97. 25 cents.

Advanced Hand-Camera Work and Focal-Plane Photography. By W. Kilbey. 1904. 50 cents.

From an enlargement
Walter Zimmerman

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Enlargements from Small Negatives

Among the many pleasant byways of photography, none gives more satisfying results than that of enlarging. The making of negatives and trial prints from them is, with many, only a means to an end, and that end is the rendering of one's best work in large sizes. This may be done by direct enlarging on bromide paper, or transparencies, or by means of permanent, enlarged negatives, which will permit of any desired number of prints in any medium or form that may be selected.

Rudimentary Principles

For those who are entirely unfamilar with photographic enlarging, the science of it may be made clear in a very few words. It is exactly the reverse, in every way, of making a negative with a camera. In enlarging, the negative is placed in the back of the camera; the light passes *backwards* as one might say, through the negative, and lens, and the image is projected on a screen in front of the camera. This image, being a negative, produces a positive. It need hardly be added that, to produce an original negative, the subject is in front of the camera; the light from it passes through the lens to the plate or film in the back, giving the picture image, which, being developed, produces a negative. In the case of the original negative, it is the strong light from the large image which is concentrated to the small image at the back; and, in the case of the enlargement, it is

the weak light (that passing through an aperture 4 x 5 inches, more or less) which has to be spread out over the larger surface, say 11 x 14 inches, more or less. Therefore, the exposure required to make the enlargement must be far greater than that ordinarily required to make an original negative. It must also be remembered that, under similar conditions as to light and density of negative, the greater the image projected on the screen, the longer the exposure required. In fact, the well-known rule as to light, that its intensity is inversely as to the square of the distance, applies here. For instance, a print made through the camera, of equal size with the original negative, will require, by experiment, a certain exposure. An enlargement to three diameters would require nine times that exposure; and an enlargement to four diameters will require sixteen times that exposure, and so on. This rule may be of considerable assistance in getting at the required exposure for various sizes.

This little handbook will aim to cover the entire field of enlarging, the several branches of the work being treated of in the following order.

Apparatus, from the simplest, for occasional amateur use, to that required by professionals for constant use; the several kinds of paper and plates that may be used; directions as to focusing and exposure; development and developers; glass positives and transparencies; negative enlargements on paper and glass, made from small positives: by contact, and direct from bromide enlargement, and finishing and mounting.

Apparatus

The wise photographic enthusiast will, at the outset, hardly fail to study over the various kinds of enlarging outfits at his disposal, rather than hurriedly take the first idea that presents itself, and, perhaps, regret his hasty expenditure.

The choice—to be described in order—is as follows: (1) A simple, portable, ready-made box or enlarger for making one size of prints only; (2) an easy, inexpensive home outfit; (3) a simple and cheap, but complete outfit, available for those who can spare a small room, to be devoted to daylight enlarging and other

photographic work; (4) the professional enlarging outfit for commercial work; and (5) the complete apparatus for working with artificial light.

Small Enlarging Cameras

(1) The enlarging box, made by the Eastman Kodak Company and other manufacturers, is so simple as to require very little consideration in these pages. It is a light-proof box, usually of pyramidal shape, having a negative holder at the smaller end, a fixed lens inside the box, and a paper or plate holder at the larger end. All enlargements made in this way will be of a fixed size, and the work is correspondingly simple and easy.

A Home made Contrivance

(2) For one who has any kind of a room at his disposal for photographic purposes, I will describe the simplest and most economical thing possible in the way of an enlarging outfit, by which pictures of almost any size may be made, the preparations taking very little trouble, with, perhaps, no expense at all. The requirements are these: A room, large or small, with a window, preferably facing north; protection from light by means of a dark-colored spring-roller shade; a large piece of thick or black cloth; a small, high table, to support one's camera; any hand-camera with a fairly good focusing lens, that is, not a fixed-focus lens (camera must have removable back, with place for ground glass); a low, fairly broad table—such as a card table; a flat board, large enough to hold paper of the largest size to be used for enlargements (preferably, but not necessarily, a drawing board. This board to be fixed perpendicularly with a lath triangle); some push-pins; trays, etc., for development; a kit, to hold negative in the back of the camera.

Such an outfit as that now referred to is, of course, for the use of those who will do enlarging work only occasionally; but it will answer for nearly all purposes.

The first thing is to make the room safe as to light, so that the only *actinic* light shall be that passing through the camera. A dark or opaque spring-roller shade, nicely adjusted to the window-frame, will probably keep the upper part of the window safe. If you *see* daylight, the sensitised surface will "see" it also.

As to the small, high table, it is to rest the camera upon, and it is to be placed close to the window. The backboard is to be removed from the camera, the negative to be used inserted in it by means of a "kit," and the lens opened to full opening. The back, with negative, is to be close to the window; the front, with lens, facing inwards.

The large piece of black cloth is to go underneath the window-shade and camera, and will be arranged to keep daylight out.

The enlarging board (drawing board, if convenient) is to be held upright by means of a triangular frame, easily made out of lath. It must, however, be held steadily so as not to change position, and not to vibrate during the exposure.

The low, broader table, is to be placed in front of the camera, and the upright board, with supporting frame, is to be placed upon it.

The push-pins are to keep the photographic paper in place.

With this minimum of trouble and cost, your enlarging outfit is ready, and, if there is daylight, you may experiment with it immediately.

Do not forget that the centers of the negative, lens and enlarging board are to be on a straight, horizontal line.

You can examine the workings of your apparatus more easily by using a rather thin positive, instead of a negative, in order to see the projected image.

At first, the image will be confused. Let the size be just about that which you are to use in enlarging. Then rack your lens back and forth until the image is sharp, or clearly defined, and, with a piece of white paper or card on the board, you should have a good, and plainly visible image, of the size wanted. Of course, when you enlarge, it will be the negative and not the positive that is to be used.

As to the paper, you may use Velox or bromide, as you prefer, the regular Velox requiring 60 times the exposure of the bromide, and the "special" 12 times the exposure. Instead of Velox, Cyko, Artura, Argo, or any other gaslight paper can be used The rapidity

varies with the different papers but is easily ascertained by experiment.

You will find the subjects of focusing, exposure, development and finishing referred to further on in this monograph. Should you still have daylight coming from the window, and fogging your work, you may use the focusing cloth of your camera as a hood reaching from the camera to the board, and keep your paper safe from fog in that way.

An Economical Home Outfit

(3) A home enlarging apparatus, for use with daylight illumination, giving positive or negative enlargements on paper or glass, of any size that may be desired, and, therefore, adapted to all artistic and even professional use, may be made at not much greater cost than the enlarging box first mentioned. It requires, however, a small room adapted to this particular use, If such a room can be spared, the results will be exceedingly satisfactory.

Although the small room for this purpose is referred to as being expressly for enlarging, it may also be used as a room for all photographic work. This room ought to face the north, if at all practicable, since the sun shining on the reflector, to be described, would cause great irregularity in illumination.

The photographer who intends to make his own enlargements requires two trays of the size of the largest prints or plates that will be made; and, preferably, two of each smaller size. There should also be running water and a sink large enough to hold the largest tray to be used, to carry off waste-water. Shelves for chemicals and a large shelf for trays, large bottles, etc., are also a part of the outfit needed for this enlarging and developing room.

Essentials

The special apparatus required for daylight enlarging is as follows: A good lens. (If you have a high-grade lens in your camera, it may be used, without detaching, and this article presumes that you have such a lens.) A window-board to hold the negative or kit; a kit, or set of kits, to hold negatives; a shelf from the window-board, to hold the camera; a red or opaque roller shade

(or both) and strips to keep it in place; a black curtain for the door; a perpendicular easel; and a white-painted board for a reflector.

The materials for this special apparatus will cost about five dollars. It will then be a question as to whether you will do the carpentering yourself or will have others to do it for you.

What Happens in Enlarging

With this very simple apparatus, to be carefully described below, it is an easy matter to convert the room to be used into a large camera, as already stated—you operating it inside, instead of outside, as with your hand-camera. The operation of the equipment may be made clear in a few words:

The light of the sky, falling on the white-painted board or reflector passes through the negative fastened in the kit set in the window-board. This reflected light, passing through the negative and the lens, is projected in a positive image, to be focused to the size desired on the easel. When the sensitised paper or plate is attached to the easel, where the image appeared, and properly exposed and developed, an enlarged positive or print from the negative will result.

All of this is, of course, exactly the reverse of the other work done by the camera in the open air or the studio, where the light from the large object or group of objects passes through the lens, into the camera, and is refracted on to the small plate or film which is to become the negative; as already mentioned.

This explanation will be wholly superfluous to the reader who is already familiar with enlarging work; but it is necessary for the intelligent understanding of readers who have had no such experience.

The technical description of this special outfit now follows, and may be turned over to a carpenter, in case the photographer does not intend to handle the tools himself, or is not equal to the job.

The Reflector

(*a*) *The Reflector* should be of planed, battened board, 2 feet 6 inches by 3 feet 6 inches, and painted, three coats, on both sides, one side white. It is to be attached outside of the window of the enlarging room, lengthways, at an

angle of 40° to the window-frame. The lower end will be hinged to a cross-piece, about 3 x 3 inches, as long as the width of the window and nailed to the window-frame. The height of this lower cross-piece above the window-sill will be three inches; with also a space of three inches outward from the sash. These spaces are to allow for rain or snow. An upper cross-piece, same dimensions, three inches from the window pane, will be nailed 3 feet 6 inches above the lower one. The reflector will be kept in place by two chains, each 3 feet 3 inches in length. The chains will have rings at the further end. There will be two large ring-headed screws screwed into the upper cross-piece. The object of the rings is to allow the reflecting board to be pulled up to meet the upper cross-piece when out of use, if desired; rings of the chains to be held in place by a nail on each side, three inches above the lower cross-piece. The front and side elevations of the reflector will appear as in Fig. 1. (See page 154.)

Window Board

(*b*) *The Window Board* is intended to keep out light from the lower part of the window, and to hold the negatives, from which the enlargements are to be made, in place. Its length will be the width of the inside of the window frame, in the clear, and the height or width 2 feet, 6 inches or more. It should fit close, inside the sash, but allow the window to open and close. The top should be weather-stripped to fit the bottom piece of the sash when open, and in use. From the center of the length of the board, and at a point one foot higher than the top of the lower cross-piece outside, mark the center of the opening for the negatives or the negative kit. This opening will be ⅛-inch smaller, each side, than the kit or the negatives to be used. The exact size of negative or kit will then be cut in $\frac{1}{10}$-inch deep. The ⅛-inch difference, or bevel, will be a flange to hold negative or kit securely in place. There will be a small spring on two sides, held by a pivot or screw, to fasten the glass or frame. The window board is to be painted, the inner side black, or covered with black paper. It can be constructed of lath framing and cardboard or any non-actinic fabric.

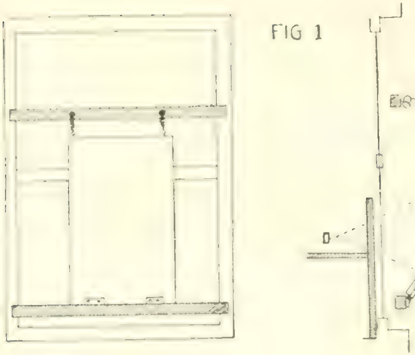

FIG 1

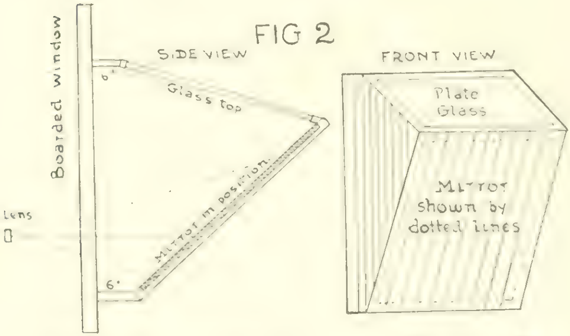

FIG 2

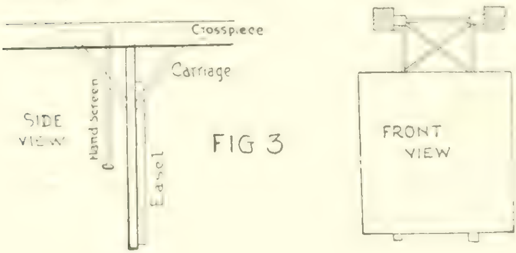

FIG 3

Kits

(c) *The set of kits* for negatives may be ordered from any photo-supply house. They will be furnished complete for all sizes, fitting into one another, up to the largest size of negatives that you intend using. If you may use as large as 8 x 10-inch negatives, the kits will also take 6½ x 8½, 5 x 7, 4 x 5, and 3¼ x 4¼ inches. You should order this in advance of everything else. If you will use one size only of negative, the kit may be dispensed with.

Camera Shelf

(*d*) The camera shelf will be wider than the length of the closed camera, and will extend outward, into the room of a length equal to the full length of the camera, with the bellows extended. It will be stripped at the sides, to hold the camera firmly in its place, but allow lifting in and out of place. The shelf is to be perfectly level, and at a right angle to the board. As to height, the center of the ground glass of your camera must be opposite to the center of the opening for negatives. In other words, the centers of lens, ground glass and window board must be in a horizontal line, at a right angle to the window board.

Window Shade

(*e*) The spring roller shade may be opaque or a safe red, as preferred. The red curtain material is furnished by supply houses. The red shade has the advantage of giving visible light in the dark-room, not affecting bromide paper or slow plates. If, however, fast plates are to be used in enlarging, then an opaque shade also, or instead, is necessary. If you have both, one may be hung above the other, and either or both used. When there is no enlarging or developing, the shade or shades may be rolled up, for light and air. The shade should fit the window space neatly and there should also be a two-inch strip fastened down each side, to keep the shade in place, with a space of one-half to one inch for the shade to work up and down.

Easel

(*f*) The easel is, preferably, a drawing board of white pine more than twice the size of the largest paper that you will use. For instance, if your largest work will be 14 x 17 inches, paper or plate, then a convenient size

of easel would be about 30 x 34 inches. Smaller, down to exactly the 14 x 17 inches, would be quite possible; but there are cases where one will use only a section, and sometimes even a corner—a face for instance—of a negative, when the paper will have to be shifted to correspond. (The easel board may, instead, be smaller, and be arranged to shift up and down and laterally; but this would add to the trouble and expense, as compared with the larger fixed board.) The stand will have two floor pieces, each two feet long, and two uprights, from the floor pieces to the top of the board. The exact center of the board is to be opposite to the lens. The floor pieces should have a roller at each corner. The board may be nailed to the side pieces, but it will occasionally, be useful for the board to be free to swing on a pivot. This would be required for orthographic projection, to be treated of later.

Door Curtain

(*g*) The door curtain will be that of any photographic dark room, and may be of any black material that will keep out daylight. Black cotton twill is very suitable.

Adjustment of Reflector

It will be noticed, and perhaps be supposed to be an error, that the center of the negative will be about 18 inches above the window-sill, while the bottom of the reflector will be only six inches above the sill. That is, two-thirds of the reflector will be above, and only one-third of it will be below the center of the negative. This arrangement is intentional, and the reason easily understood by observing the dotted lines from the lens to the reflector on the right hand portion of Fig. 1. The inclination of the reflector necessarily gives the long upper line of the reflected light rays. The correctness of this arrangement may be further tested—and ought to be in any case—when everything is in place—by looking through the lens, upward and downward. If the top edge of the reflector can be seen, it should be raised to a smaller angle. If it can not, you may increase the angle (thereby slightly increasing the illumination of the negative) until the top of the reflector can be nearly, but not quite, seen. It is impossible to give directions for construction with mathematical accuracy,

From an enlargement
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on account of the large variation in focal length of the various kinds of lenses that are likely to be used.

Room Space and Focal Length It should also be added here that a very shallow room is not suited for a very long focus lens. As this arrangement is, however, intended for the employment of one's own camera lens, its focal length, 6 to 10 inches, should be quite sufficient for enlarging even in a small room.

The working effect of the apparatus may be tested, in daylight, by pinning a sheet of white paper on the easel board with a positive or negative placed in its kit, the camera (with ground glass removed) in place in contact with the kit, and when focused, a clear image will be projected on the paper. If a positive or lantern slide be used for this test, then the image will be in correct lights and shades, instead of being reversed.

The Professional Outfit (4) A daylight enlarging apparatus for professional use is similar in general plan to that just described, except that a more costly outfit may, at the pleasure of the photographer, have the following variations: (*a*) A boxed mirror, which gives a much stronger illumination than the painted reflecting board; (*b*) A separate camera and lens, to remain in place; (*c*) A suspended enlarging board, instead of the easel; (*d*) A separate room for developing, etc., and (*e*) Light-tight inside shutters, instead of a roller curtain, for greater safety, particularly in the event of long exposures being necessary.

The only items above requiring description are the mirror and the suspended board. The camera and lens are always kept in place for constant use. The camera shelf is arranged to swing laterally on hinges. The lens should be suited for negatives up to 11 x 14 inches.

Boxed Mirror (*a*) The mirror is to replace the painted board, and should be boxed for protection from the weather. The angle will be between 45° and 50°, to avoid reflection of any overhanging eaves or cornice. If large work, such as enlarging from an 11 x 14-inch negative is anticipated, then the mirror might be still larger, say, 3 feet 6 inches by 4 feet 6 inches. On the other hand, the longer focus

professional lens receives the rays at a much smaller angle than the short focus lens of the hand-camera. The mirror should be framed and backed with seasoned wood. A piece of plate glass at the top of the box will keep out the snow, rain and (to some extent) dust.

A sketch (Fig. II. See page 154) of the mirror box will give a better idea than further description.

It will be seen from this sketch that the light from the sky comes through the glass top and is reflected at a right angle through the negative in the window board. Although the clear glass at the top is placed sloping to allow rain to run off, snow will lodge, and will have to be brushed off from within by opening the window and shutters—a simple matter.

Suspended Easel The Hanging Board is a great improvement over the easel resting on the floor. Two strong seasoned pieces, of clear yellow pine 5 or 6 inches square, are fastened to the ceiling or from front to back wall, 9 or 10 feet above the floor, 18 inches to 2 feet apart, and at right angles to the window. A long flange or strip, 2 inches square is fastened on each inner side, at the bottom, for the carriage to run on and to hang from. This carriage will have two horizontal pieces, each 3 inches square by 2 feet long, to slide on each flange. A long piece, each side, 2 inches square, will hang to support the enlarging board: and two diagonal pieces on each side will hold the frame rigid. A handscrew, back of the board, keeps the latter from shifting after the focus has been arranged. If orthographic projection (from converging lines) will be required, the board may be secured at the top with strong hinges, and the proper angles obtained by means of notched pieces at the bottom. The size of the enlarging board will be at least ten inches on each of four sides larger than the largest enlargement to be provided for. The board must be of thoroughly seasoned white pine, battened and perfectly planed. Fig. III (See page 154) gives an idea of this arrangement.

The height of the board above the floor is not given in the sketch; but the center of the board is to face the lens, which is usually 3 feet 6 inches to 4 feet above the floor.

Artificial Light Apparatus

(5) An enlarging outfit for artificial light may be made up, either from the amateur or professional apparatus above described, with these changes:

The reflector, and all arrangements as to the window, will, of course, be dispensed with. Instead, there will be required: A pair of condensers, mounted; a strong artificial light; and a large light-tight box, or camera.

Condensers

(*a*) The condensers, in large sizes, are costly. They are, practically, one large double convex lens, in a frame. The diameter of the double lens must be an inch greater than the diagonal line of the largest negatives from which enlargements are to be made.

Illuminants

(*b*) The one best artificial light is the electric arc. There are numerous makes, and one should carefully investigate before buying. Ask for a photographer's arc light, used for blue-printing. This kind is adjusted for the long arc, giving a violet (strongly actinic) light. There must be a switch and handle *outside* the camera, to enable the operator to shut off the light after each exposure. Safety from the killing shock is a necessity. (Never attempt to repair the switch with the current turned on.)

A fairly good enlarging light is also a double or triple Welsbach "battery," with a hot-air pump for forced draught, which may be obtained from incandescent mantle dealers in large cities.

Other lights available are the single Welsbach, the ordinary gas-jet and the oil lamp. Whatever the light used, it is centered to a line drawn through centers of lens, negative and condensers.

[For those who prefer to work altogether by artificial light the commercial enlarging lanterns such as the Ideal or Franklin enlarging outfits, readily obtainable, offer many conveniences.—EDITOR].

Light Box

(*c*) The camera is a big box to hold the light, say 3 feet high, 2 feet wide and 3 feet long for electric light, and may be somewhat smaller for the other lights. It must have plenty of light-proof ventilation. The condensers will be fixed in a round opening, and the kits and cam-

era shelf will be outside, as described for daylight work. The big light-box will have a tight door, hinged, for getting at the light, for changes or repairs.

Resumé It will be obvious, from the description of the daylight apparatus, that the arrangement of parts for artificial light is as follows: The big light-box or camera, at one end of the room; the light in about the center, centered to the condensers; the condensers at the nearer end of the box; the negative kit, or set of kits, preferably in a sliding board, for changing negatives; the lens with bellows and screw for changing focus; then the easel: the centers of easel, lens, kit, condensers and light, to be on one horizontal line.

I have now given descriptions of several complete enlarging outfits, adapted to various preferences, necessities, and (highly important) bank accounts.

Bromide Enlarging Papers The coated paper most generally used for photographic enlarging is known as bromide paper. This surface is very sensitive to the light, being several hundred times quicker than solio, or printing-out paper; 60 times as fast as ordinary gaslight or development paper; about the same speed as a "slow" plate, and one-eighth the speed of a "fast" plate. It should be handled in a safe yellow or red light, and should be kept in the original package until all has been used. From what has been said of the speed of bromide papers, it is evident that we can safely use more light in its manipulation than we are accustomed to use with plates or films. The working light should be "safe" but abundant, so that one can conveniently see what one is doing at all times.

There are several different makes of bromide paper and, as their sensitiveness differs, the only practical method is to stick to one maker's product and familiarize oneself with its speed and general characteristics. The principal varieties available are the papers made by the Eastman Kodak Company, the Defender Photo Supply Company, Elliott & Co., and Wellington and Ward, these last two being English papers imported to this country. Each maker has several grades differing

in surface, texture, finish, weight and color, for particulars of which the reader should see the trade catalogues. Broadly classified the commercial papers are spoken of as Glossy, Smooth, Rough and Extra Rough, most of these being obtainable in thin, thick and extra heavy weights. Bromide papers are usually white, but cream or buff papers are supplied for pictorial work.

Focusing

The careful worker will, before commencing to make his enlargements, examine the negatives that he intends using, or, better still, solio or print-out paper proofs from them. He will then decide whether the best or most artistic effect is to be obtained by using the whole negative, or whether the composition will be improved or the important features be brought out better by using only a certain portion of it. He may cut out from his proof such parts as are not desired for enlargement; and, by pasting the cut-out parts on the back or glass side of the negative, he will, in that way, have thrown on his screen exactly the portion to be reproduced in large size. It is advisable to pin a piece of white paper or card, of the exact size of the enlarging paper to be used, on the enlarging board. By moving both the board and the lens of the camera back and forth, the image will be thrown on the paper, approximately the right size. If the negative is fairly thin, and the image, or part of it, is sharp, a correct focus will be very easy to obtain. If, however, the negative is entirely soft,—that is, without any lines to focus by,—or if it is so dense that the projected image is very weak, then an exact focus may be obtained by means of the substitution of another negative, thin and sharp, using it for focusing, and then replacing the negative to be used. This is an easy way for obtaining accurate focus.

As to cutting down the lens by the use of the diaphragm, that is a matter of taste as well as of the quality of the lens. All of the highest grades of lenses give equally sharp images when wide open as when cut down. A somewhat inferior lens has to be cut down a little in order to have sharpness. The question of cutting down applies also to the effect desired. A print made with a strong, quick exposure (as with a strong

light, fast lens and thin negative) will be more flat and have more detail than one made with a longer and weaker exposure, as made by reducing the light by cutting down the lens; the latter method, in this way, increasing the contrast.

There is also a question of art or of individual taste entering into the matter of focus. I know a photographic worker whose enlargements are greatly admired. All of the lines are slightly blurred, giving a softness of outline in all of her work. I am sure that the effect, in this case, is obtained by means of a rather poor lens, used wide open, rather than from a good lens, a little out of focus. For technically perfect work, the high grade lens, or the stopped-down lens, is a necessity.

When films are used for enlarging, they are to be placed between two pieces of glass, of the right size. All negatives are to be placed in the negative holder with the upper part down and the coated side inward, or facing the screen.

Exposure

The time of exposure is, of course, the principal difficulty with a beginner at this work. A great deal of bromide paper may be saved from waste in the following very simple way. Make solio or print-out paper proofs of all negatives intended to be used for enlarging. Print to the exact depth required to proof (not tone) the negative to the best advantage. Do all of this proofing by clear midday sun. Time, accurately, minutes and seconds required for correct proofing of each. In this way, a scale, or ratio of relative exposure will be obtained beforehand for every negative. It will be found, for instance, that of two negatives of apparently equal density, one developed with pyro will print more slowly than one developed with metol, and that an apparently quite thin yellow (pyro stained) negative will take a much longer time to print than was anticipated.

With the "printing times" known, your negatives may be classed into two, three, four, etc. "times" the time required for your quickest printing negative; or better, if there is a large proportion having the same printing time, use that time as a standard, considering others as requiring so many times that exposure, or such

From an enlargement in gum-bichromate
Walter Zimmerman

From an enlargement
Walter Zimmerman

a fraction of it. Your standard of time will then be applied to the image on your board or paper (if with daylight enlarging) on a clear day, and between eleven and one o'clock with the lens wide open. Any cutting down of the lens after that will increase the exposure in direct ratio to the cutting down of the illumination. In fact it is desirable to learn beforehand the relative illumination for various points on the diaphragm scale. All of this makes very tiresome reading, but it saves a great deal in photographic material. After you become expert, if your eye is true as to the effect of light, you will be able to discard all of this and can get exposures very accurately, merely by examining the image on the screen, although the yellow pyro negative will deceive almost the best expert worker.

Use of Test Strips

To start right, you will have to waste one or two pieces of paper, but can economize greatly in the long run. Take either a full sheet or a full length strip of the paper to be used, and pin it in position after focusing and arranging. Remove the cap from the lens, and, with a piece of card or opaque paper, in readiness, expose the whole piece five seconds. Cover one-quarter of the paper and expose five seconds more; cover one-half, and continue five seconds; cover three-quarters and again five seconds; after which cover the paper and replace the cap. This one exposure in four parts must be accurately done as to time. If this sheet or strip is then properly developed—which means fully developed, but not forced—without any regard to the appearance of the image, and then dipped for a minute in hypo, the result may then be carefully examined by daylight. The lightest section will have had 5 seconds, and the others, 10, 15 and 20 seconds exposure. If one section is just right, that will indicate the correct exposure, under similar conditions, for that negative. If all parts have been overexposed or all underexposed, then the experiment must be repeated, commencing, for underexposure, with 30 seconds and give three additional exposures of 10 seconds each, making 30, 40, 50 and 60 seconds. For overexposure you would try one, two, three and four seconds. Then, making your first enlargement,

according to the exposure found in this way to be right, when properly developed, fixed and washed, ought to give entirely satisfactory results.

You can work more conveniently if you will buy, before beginning your enlarging, an orange screen to fit your lens, and some glass-headed tacks, called "push pins." The former enables you to see that you are placing the paper accurately on the screen; and the pins will be easier to use than ordinary pins or thumb-tacks. The push pins should be inclined outwardly, in using, in order to avoid shadow causing white corners on the enlargements.

Development If you are already accustomed to the development of Velox or any other gas-light printing paper, very little need be told you in regard to the development of bromide paper. In fact, this subject has been treated of so often that reference need be given only to a few leading principles. For paper, pyro is unsuitable. There are a number of good developers, metol, hydroquinone (and these two in various combinations), amidol, ortol, and several others. Papers or tubes of several of these, ready for use, are time-savers and money-spenders. These ready-for-use developers are usually made from various formulæ with metol. It is far more economical to make up one's own stock solutions, formulæ for which are given with all packages of developing paper. Metol works for softness and detail; hydroquinone for strength and contrast; combinations of these two give detail and strength; amidol is extremely simple to make up, and gives a pleasing blue-black. Strong metol-hydroquinone keeps in solution many weeks; amidol will keep several days in solution, but deteriorates even in powder. Metol-hydro will do a great deal of work before having to be thrown away, ortol and amidol will develop several prints before spoiling. Rodinal is the simplest of all, gives good results and keeps well. Its only disadvantage is that it is expensive for one who has much developing to do.

Do Not Stint Developer An important secret of good development is to use plenty of developer. The print to be developed should be fully and liberally covered, the tray two-thirds

filled. This gives better chemical action and avoids oxydising by the air—yellow stain,—by neglect as to keeping covered. It is always cheaper and better to be free with developer than to spoil paper by using old or poor developer, or too little of it. For the larger sizes (over 8 x 10 inches), the paper ought to be first immersed in clean water, so that it will lie smoooth and flat in the tray, and thereby prevent uneven chemical action.

When a print has been correctly exposed, it should be fully developed, that is until the chemical action appears to have ceased. In other words, full development is correct development. If the image comes very quickly and the print has to be removed before action is complete, it has been overexposed and will be flat, muddy, and perhaps, streaky. If, after chemical action ceases, the print is still weak and lacks graduation or detail in the higher lights, it has been underexposed. Remedy, in either case, for the best results; do it over again, changing the exposure proportionately. If, however, you want to diminish or to increase either the detail or the contrast, then, for detail and softness you somewhat overexpose and slightly underdevelop, and, for contrast, you underexpose and overdevelop.

About "Bromide" A few words in regard to the use,—or, frequently the abuse,—of bromide of potash will be useful here. Strictly speaking, I consider bromide, as a restrainer, to be simply a makeshift for the inexperienced. It is like making up a good chemical and then adding something to injure it. Bromide really acts, to a small degree, as a destroyer of the developer. For the inexperienced, it is, I suppose, useful. It is like swimming with a cork jacket. With correct exposure and proper—that is, again, full,—development, the "few drops" usually recommended, of bromide "dope" are not only totally unnecessary, but better omitted.

Rinsing: Fixing: Washing The reader of this need hardly be told that, after development, he will rinse off the developer, fix in hypo for fifteen minutes (the print or prints being again fully covered), and wash for an hour or more in running water.

Drying Prints Large bromide prints should be hung to dry. The most convenient way is to stretch a wire from wall to wall, and to string on it a number of spring clothes clips, the prints to hang from one or two corners until dry. After this, they should be laid smoothly under a board or piece of glass and a weight, on a flat shelf or table, which decreases the tendency to curl. If it is not intended to mount the prints, they will also partially lose their curly inclinations by keeping them in a portfolio. The glycerine bath removes this tendency completely. It is made up of one part of commercial (much cheaper) glycerine to four parts of water. After soaking several minutes, the prints are promptly hung to drain and dry. If unevenly dried, the glycerine may collect in some places, giving a transparent, and perhaps sticky, effect to the paper. Remedy, if this occurs; wash, soak and hang up again. The glycerine bath may be used many times, but it becomes too strong when the water evaporates after a few days.

Mounting As a rule, on account of the curliness of all gelatine-coated papers, particularly in the larger sizes, bromide enlargements should be, and usually are, solidly mounted on card. The effect is less pleasing, but the result is safer. To mount in this way, have the card cut in size to suit—larger than the print. Immerse all of the prints, one at a time, in a large tray of water. Have a piece of clear glass, larger than the prints. Take out the prints, one at a time, and spread face down on the glass, each print to lie flat and smooth, on top of the others, until all are so placed. Then squeeze them thoroughly, to remove all the surplus water. With your jar of white photo-paste—nothing else, or you will be sorry—and a flat white bristle brush (an inch and a half wide, 10 cents) spread the paste, fully and evenly, but not thickly, over the back of the top print. Leave no loose bristles on the paper, as they would show. Be particular that the edges also are properly pasted. Lift the print carefully by the edges and turn face upwards. If you hold by two diagonal corners, you can let the two other corners drop into position, and then lower the

parts that you hold. You can, in this way, get the print in its right place quickly and accurately. Rub down from the center outwards. If you happen to get paste on the paper or the mount, take it off with a piece of wet cotton, and dry at once with a clean blotter. Proceed with the next print in the pile, and so on. As each is finished, you can, to prevent curling, place a clean white blotter, the size of the print, over each one, with a board or glass and weight on top. If a part of a print happens to stick to the blotter, after drying, over night, lift the rest and let a drop of water fall on the part that is stuck. They should not stick unless you have failed to remove the surplus water with the squeegee, or have put on too much paste.

Glass Positives or Transparencies

After you have learned how to make satisfactory bromide enlargements, you should have no trouble at all in making enlargements on glass, either as positives, called also transparencies, or negatives, the latter to be used for making large prints by any printing method, instead of being confined to the use of bromide paper. To do this, you will first have to know the relative speed of the plate that you will use, as compared with bromide paper.

Relative Speeds

These relative "speeds"—so called, for brevity—are approximately, as follows: A "fast" plate, such as Cramer Crown; Seed "27" say, one second. "Banner X" Seed 26 X, one and one-half seconds. Standard "Orthonon," two seconds. Seed "23," Cramer "Anchor," three seconds. Cramer "Contrast," six seconds. Eastman and Defender bromide papers, eight seconds. Seed "Process" Plate, twelve seconds. This means, of course, that a negative which will give a certain enlargement on bromide paper in eight seconds, will, under precisely similar conditions, give an enlargement of the same size on a fast plate in one second, and so on, according to the speed of the plate.

Manipulation

No further apparatus is needed for making plate enlargements. Provide yourself with a sheet of black cover paper, and a piece of white cardboard, the size of the plate to be used.

If at all doubtful as to exposure, you may, in ordering large plates, order also a package of the same emulsion, lantern slide or other small size, and use these for trial, to save waste of big plates.

Pin the large piece of black paper on the easel, and use the piece of white cardboard (the size of the plate) to focus on, and to get the exact position of the image. Support the cardboard with three push-pins, pushed in firmly, two under bottom corners, and one beside top of one side. When sure that the image is satisfactory on the cardboard, place the black cap or red screen on the lens (not the yellow screen, except for Contrast and Process plates) and lift the cardboard off the push-pins. Make sure that all daylight is excluded, and that the only light is the red-orange lamp at the developing tank before opening the box of highly sensitive plates, if you are using one of the faster grades. Take the plate, and dispose of dust by tapping it, held sideways. Then slide it over the black paper, coated side outward, until it is firmly held by the three push-pins. Drive in a fourth push-pin at the other upper corner. Handle the plate by the edges, and avoid touching the sensitised surface. Remove the cap, without jarring the lens, and give the exact exposure intended. Replace the cap, take out one pin, lift off the plate, and develop.

Development With a fast plate, as an additional precaution, it is well to have a cover for the tray, to avoid fogging even by the red-orange lamp. This is especially necessary with Orthonon or other red sensitive plates.

You probably know, without reminder, that the faster emulsions develop more slowly, and the slower emulsions develop quickly. Remember, also, that the developer that you use, if of a regular strength, and if at a uniform temperature, will require a fixed time to do its work properly. If, by experiment, you find one plate, small or large, to develop fully and properly, in three minutes, then all other similar plates, properly exposed, and with the same developing mixture, at the same temperature,—a repetition because important—will require three minutes, without uncovering or examining. This rule applies to all plate development, and has the addi-

tional advantage of giving greater uniformity for the use of your positives or negatives in printing.

All of the above remarks apply equally to the making of positives and negatives on the screen.

The purpose for which you are making positives will affect your development somewhat, in this way; if you are making transparencies, to hang in the window, you want strength, detail and contrast. Pyro and hydroquinone are the right developers for this. If you are making large positives, in order to make negatives by contact, then you want a soft working developer, giving detail, and metol will give this result. It is important that the contact positives shall not be "choked up" in the shadows, in order to avoid having negatives from them which would be choked in the highlights.

If you prefer, you may vary the above directions by placing the negative in the kit, glass side in; and, in that case, place the large plate in position, coated side next to the black paper. The object of the black paper on the screen is, of course, to avoid spreading or reflection of light, called halation.

Orthographic Projection

Orthographic projection means the arranging of the light rays through a negative or positive, in which lines intended to be parallel appear as converging or diverging, in such a way that the projected image shall have this error corrected and the lines which should be parallel made to appear so. The error is caused, even when a good lens is used, by tilting the camera up or down, instead of raising or lowering the front board. This tilting of the camera puts the parallel lines into perspective, and gives a converging effect in the negative.

The correction is made by having the enlarging board hang from hinges, or rest on a pivot. When such a negative is put in its holder and focused on the screen, the latter will then have to be inclined until the lines become perpendicular and parallel. The board will then be secured at the required angle. The focus first arranged need not be altered, but the lens must be considerably stopped down, in order that the whole image may be brought into focus. The portion further from the lens will be wide, and the nearer portion narrow.

Framing Transparencies The window ornaments, called "transparencies," may be made by buying (or making, if expert) frames to fit the positives. A piece of ground glass is put in the frame, back of the transparency. Instead of ground glass, you may use a plain sheet floated with "ground glass substitute," if you can learn to float it on properly. Thin oil- or paraffine-paper also answers the purpose, and is cheaper. A piece of ordinary glass will keep the paper in place.

Retouching and Spotting Retouching for defects, or improvements desired, is done with a few drops of retouching varnish rubbed over the film surface quickly, thin and evenly, and then dried thoroughly, being the medium on which lead-pencil marks will hold. Several grades of pencils, from soft to very hard, should be at hand, all finely sharpened. A little practice, and retouching will come easy.

Spotting is done with a very fine pointed brush. "Opaque" is the most easily used color.

Negative Enlargements Negative enlargements may be made in several ways, according to preference.

(1) A negative enlargement from a contact positive. The positive ought to be, in appearance, a perfect print. It should be clear, translucent in every part, shadows included, and should give full gradation and detail. To make such a positive, it should be fully exposed and normally developed in metol, rather than with pyro or hydroquinone. It is entirely practicable to make the positive described, even from a harsh, dense original negative, according to these rules. There should be no retouching on either original negative or contact positive. If required, all the work has to be done on the negative enlargement.

(2) A partial enlargement in positive, and a second enlargement in negative, is frequently the professional method, but it is undesirable, on account of possible loss in "quality" in each of two enlargings, with no corresponding advantage.

(3) A positive of the size to be used for the negative, and a constant negative from it, produces the best result. The positive can be used, by contact again, to

From an enlargement
Walter Zimmerman

From an enlargement
Walter Zimmerman

replace a broken large negative. Retouching can be done on the large positive, and completed, if necessary, on the negative. The exposure by contact is made at a fixed distance for all work of this kind, say, five feet, from a uniform light, such as an ordinary gas flame. An experiment as to exposure may be made with a small plate first, for economy. Positive and plate for negative are placed film to film in a printing-frame of the size of the plates. A piece of black paper, same size, back of both, decreases possibility of halation.

Negatives from Bromide Enlargements

(4) A contact negative from a bromide enlargement has many advantages. The paper can be worked up in pencil, front and back, for any improvements or modifications desired. Clouds may be "wiped in" on the sky portion with lead-pencil dust and a tuft of cotton. This should be dusted on the places for the darker parts first, and then rubbed. This is very easy when one has the artist's idea as to what clouds "look like."

In exposing in a printing-frame, first take a piece of clear glass, then the bromide enlargement, then the plate (coated surfaces together), and, finally, the back-board of the printing-frame. One period of exposure, found to be correct, with the right exposure, other factors being equal, will apply for all negative making from bromide prints. The best plate for this purpose is the Cramer Contrast plate. Approximately, with thin bromide paper, with this plate, and an ordinary gas-jet five feet distant, the exposure is twenty-five seconds. For a fast plate, the exposure, under these conditions, would be three seconds. It is, however, rather safer to experiment with little plates, to get the correct exposure, and then all alike, after that. Negatives properly made by this process are not only fairly good but first-class, and they save the cost of making large glass positives. The grain of smooth, thin paper does not show on the negatives, except with underexposure and forced development.

WALTER ZIMMERMAN.

Supplement

DEVELOPING-PAPER ENLARGEMENTS

If one only cares to produce an enlarged image of the record of fact picture secured by the use of the small camera, the process of making enlargements is simple enough for the merest amateur to attempt and become fairly expert in; but when you think for a moment of the hundreds of really beautiful pictures made by this process, exhibition pictures, masterpieces by famous workers, and prize-winners in great competitions, you will realize that these pictures possessed something more than an enlarged image of the little 2½ x 4¼- or 4 x 5-inch plate; rather believe that the individuality of the worker was expressed in his or her method of handling the negative, modifying developer to suit the paper, softening harsh lines and too heavy shadows.

While it is not difficult to describe the kind of apparatus necessary, and the requirements for making enlarged paper positives or negatives, it might be somewhat difficult to explain how one person succeeds in obtaining a pleasing effect from a small negative, that in another's hands gives a very ordinary result. It is not from loss of detail always, though it may have been suppressed somewhat; nor is it always because of an unsharp image. It is a subtle something which is as characteristic of the artist-photographer as certain effects the painter produces with his brush and colors are of him.

Sometimes it is but a decided emphasis given the foreground, or the sky, or the figure, by a little careful manipulation of the rays of light during exposure of the bromide paper; yet the result is a print which holds the interest and proves the making of the successful picture.

My first experiments were with a home-made arrangement for enlarging by daylight, at no expense to speak of. It was simply the darkroom, having an outside window, made light-tight, except for an opening left large enough to allow the back of the 5 x 7 camera to fit in. A shelf to hold the camera was placed in front of the opening, and a frame made large enough to take the negative carrier, and keep it in position at the back of the camera (the ground glass being first removed), so that all the rays of light would pass through the cut-out opening of window and then through the negative; the lens projecting the image upon the screen or easel prepared to hold the sensitive bromide paper. This easel was adjusted in grooved pieces of wood attached to the very low ceiling of the darkroom, and suspended so that when not in use it could be pushed back to the wall out of the way. As both lens and easel could be freely moved backward and forward, the size of the image was easily regulated. The negative carrier I made by removing the middle section of an old 5 x 7 plateholder, using pasteboard kits for different size negatives.

This method of enlarging was not always satisfactory because of the limited size of enlargements and the uneven light.

I then procured an Ideal enlarging lantern, burning gas and using the ordinary Welsbach mantle with 6½-inch condensers. This I found to be a practical apparatus for all small negatives, 4 x 5 inches or less, but the next size larger, having 9 inch condensers, is preferable, allowing enlargements from any size negative up to and including 5 x 7 inches.

I now use a similar outfit to the above, together with an old Voigtländer lens of short focus, and since most of my enlargements are made from negatives 2 x 4 or 4 x 5 inches and enlarged to 10 x 12 inches or larger, I reverse the lens in the camera, by removing the front board and lens and inserting the barrel inside the camera box, the board fitting either way. This allows whatever magnification is desired.

The kinds of negatives I consider suitable for enlarging purposes and aim to make, are, first: A normal negative of good density and not too much contrast,

fully exposed but a little underdeveloped. Such a negative will give a rich print, with good blacks in the shadows, and plenty of half-tones, if exposed correctly and development allowed to proceed far enough.

Second: A rather thin negative, but one full of detail. From this sort of negative an exceedingly pictorial result may be obtained.

Third: From a negative strong in contrast, but not dense, such as window-lighting subjects, very beautiful enlargements may be made, but the method of procedure in regard to development varies slightly, as does also the choice of paper.

To begin with the latter rather contrasty negative; I prepare my developer after this formula, given by the Artura Photo Paper Company for their products, and find it works equally well (by diluting) with Royal Bromide or P. M. C. of Eastman's manufacture. Water, 20 ounces; metol, 14 grains; Sulphite of soda (dry), ½ ounce; hydroquinone, 60 grains; carbonate of soda (dry), ½ ounce.

When ready to develop, add saturated solution of potassium bromide, one drop to each two ounces of developer.

In another tray I put 8 ounces of water, and add ½ ounce of a 10 per cent solution of potassium bromide, and after preparing an ordinary acid hypo bath, I am ready for work.

I should probably use Artura carbon black, regular weight, for this negative; the exposure would vary from thirty seconds to one minute, according to size of enlargement and density of negative, using lens at about $f/4$, which would tend to avoid additional contrast. A test strip would give the exact time.

After the exposure and before developing, I would immerse the print in the bromide bath prepared, for one or two minutes, rinse quickly and develop as usual. By this process, the shadows will not be so fully developed when the high lights start. The result will be a very pleasing print, from a negative which, if developed in the usual way, would be of the soot and whitewash sort. The theory is that chemical fog is due to the presence of free nitrate of silver in the emulsion, and if this can

be converted into bromide of silver, the print comes up free from foggy high lights, and the development proceeds more evenly. I use the same method with all over-contrasty plates, especially for interiors including windows.

For the second negative mentioned, I would use the same paper, stopping down the lens to *f* 16. The gas is turned only high enough to secure even illumination. The easel, holding bromide paper, is moved forward or backward to slightly diffuse the image, and the test is made, then the final exposure. Now an ounce or two of water is added to the developer and the print is allowed to develop slowly. The result should be that all the delicate detail of the rather thin negative will be preserved, with a trifle more contrast.

If the print is still lacking in strength, I use any slower developing paper, such as Velox or Iris, which will greatly increase the contrast, although exposure will require minutes, possible fifteen or twenty, instead of seconds. Of course, Cyko, Argo, or any other gaslight paper is equally suitable provided one knows the characteristics of the paper employed and the effects it will give.

Now for the normal negative. I obtain very pleasing results on smooth Royal Bromide paper. Exposures should be as nearly correct as possible, using test strip. Beautiful velvety blacks are secured, and the cream tone of paper gives a most artistic effect. Develop in *full-strength, fresh* developer. Sometimes I use with this paper a fine-mesh bolting silk, stretched in a frame, and held midway between the lens and paper during half the time of exposure. This gives breadth of effect, and no visible lines of the bolting cloth.

The making of enlarged paper negatives, for the pictorial worker's use, is the same process as described above, except that a small glass positive is used instead of the negative. Artura carbon black paper, regular grade, is smooth, with very little grain, and is well adapted for this work, and the ease and convenience of handling and storing the large paper negatives is of great value. I use, however, my regular plate developer, finding it excellent for the purpose, Edinol, for this

work, and as the formula is different from any published, I give it here.

Edinol Developer for Plates. Stock Solution: Water, 64 ounces; acetone sulphite, 2 ounces; edinol, 1 ounce; sodium sulphite (dry), 6 ounces; hydroquinone, 1 ounce; bromide of potassium, 1/4 ounce; carbonate of potassium, 12 ounces.

To develop, use stock 1 ounce, water 4 to 12 ounces. This solution keeps well, is stainless, does not poison, and is invaluable for under-exposures.

FEDORA E. D. BROWN.

Notes and Comment

Subscribers will note that this number of THE PHOTO-MINIATURE is dated April-September, bringing the magazine on time again, as far as dates are concerned. All subscriptions on our records have, consequently, been extended five months to cover the five issues not published. The arrangement that each volume shall include twelve consecutive numbers is not affected by this change.—THE PUBLISHERS.

Among the many inventions and conveniences introduced of late years for the amateur photographer, the Antinous Shutter Release deserves a prominent place. Every camera worker knows, by sad experience, the disappointments and failures arising from the perishable or faulty rubber bulbs and tubing attached to the shutter of the average hand-camera. The "pesky" rubber bulb release is entirely superseded by the clever little Antinous Release, which is unaffected by climate, works without vibration, is unfailing in its action, and adapted for any shutter or camera. The Antinous is made entirely of metal, except the outer covering, and offers a lifetime of practical service. It is illustrated in our advertising pages, but must be seen in action to be appreciated. The Antinous is manufactured by Wm. Watson & Sons, London, England; the wholesale agents in America being George Murphy, Inc., of New York, and Burke & James, of Chicago.

The St. Louis, Mo., branch of the Ansco Company advises us that it has added additional space to its already large quarters in that city, in order to carry a larger stock, to take care for the growing demand for

Ansco goods. The dealers in the territory covered by this office will doubtless welcome this news, which means a better and even more efficient service than they have received heretofore.

We are also glad to note that the rapid growth of the Ansco Company's business in the Northwest has compelled the Minneapolis branch of this house to secure larger quarters at 14 Fifth Street, South, Minneapolis. Dealers in the Northwest should note this change of address.

Burke & James, Chicago, have introduced a new Ingento Stereo Attachment, with several important improvements, increasing its efficiency. This instrument enables one to make stereoscopic pictures with the ordinary single lens hand-camera, thus practically doubling the value of the equipment. Circulars describing and illustrating the new attachment may be had on request from Messrs. Burke & James.

The Boston Camera Club, 50 Bromfield Street, Boston, Mass., announces a Prize Competition, open to all amateurs residing within a radius of fifty miles from Boston. Full particulars may be obtained from the secretary, John H. Thurston, at the above address. The competition closes November 1.

Pressure of space in our last number prevented notice of the Adams Minex, a new simplified type of reflex camera, possessing many remarkable features and movements hitherto not included in instruments of this class, which has been introduced by Adams & Co., 24 Charing Cross Road, London. The writer of the monograph on "Reflex Cameras," in THE PHOTO-MINIATURE No. 99, justly gives the Minex the premier position among the reflex cameras of today. There would seem to be little room left for improvement in any detail of the Minex, and readers who are thinking of purchasing a reflex camera should write to Messrs.

Adams & Company for a descriptive circular of this camera, which clearly explains its adjustments and capabilities. We are asked to correct the prices of the Minex, given in the announcement of it in our last number. These should read: Quarter plate ($3\frac{1}{4} \times 4\frac{1}{4}$ inches) £29 ($145); 4×5 inches, £32 ($160); half plate ($4\frac{3}{4} \times 6\frac{1}{2}$ inches) £41 ($205).

The catalogues issued by Hirsch & Kaiser, 218 Post Street, San Francisco, have always been good examples of what a photographic price-list should be. The 1909 catalogue, just received, is practically an illustrated encyclopedia of photographic apparatus and materials, giving concise particulars and prices of the standard apparatus and photographic sundries at present available. We congratulate this firm upon its enterprise and growth.

Of the many notable features of the recent convention of the Photographers' Association of America held at Rochester in July, none attracted greater interest than the model lens-making plant installed by the Bausch & Lomb Optical Company, in the new building recently added to their establishment. By means of this model plant, the two thousand photographers and their friends who attended the convention were able to inspect the many processes which enter into the making of the modern anastigmat, without the labor and time which would have been necessary to conduct so large a party over the ten acres of floor space where some eighteen hundred people produce the photographic and optical specialties which have made the name of the Bausch & Lomb Company famous the world over.

If there are any readers of THE PHOTO-MINIATURE who are unacquainted with the many aids to convenience and success in photographic work offered by Burroughs Wellcome & Co., 45 Lafayette Street, New York City, we would urge that they write this firm, asking

for their literature. With perhaps a single exception, we know of no house in the photographic field which has done so much to simplify photographic manipulation, and to enable the average man to obtain the best possible results with the least possible labor, and the largest amount of certainty. Among this firm's specialties, Wellcome's "Photographic Exposure Record and Diary" is a conspicuous example of the genius of Burroughs, Wellcome & Co. in condensation. It is a veritable Tabloid of photographic literature, comprising 264 pages of everyday photographic information, with an Exposure Calculator, Negative Record, Diary, and other special features, within the covers of a portfolio which snugly fits the pocket. Price 50 cents, post free.

A clever piece of condensation in the making of an illustrated price-list comes to us in Catalogue No. 59, just issued by G. Gennert, New York and Chicago. Among the new Gennert specialties we note Sylvar lenses, Series 3, *f* 6.8 obtainable in eight sizes of varying focal lengths for plates 4¼ inches to 8 x 10 inches. This series is also obtainable in cells for hand cameras, fitting several of the Anscos, Kodaks, and Hawkeyes. We are glad to note the reappearance of the Gray Extreme Angle Stigmat, which gives an angle of over 90 degrees on the plate for which it is listed, works at *f* 11, and sells at a very moderate price, including the Montauk automatic shutter. The firm of G. Gennert controls many European specialties which are not obtainable elsewhere in this country, and the wide-awake photographer should not overlook this new catalogue, which describes these specialties in detail.

Among the leading manufacturers of photographic papers in Great Britain, the firm of Wellington & Ward enjoys an enviable reputation. Some idea of the variety of Wellington papers may be had from the fact that they offer eighteen grades of bromide paper for contact printing and enlarging, and thirteen grades of gaslight papers. The Wellington papers are well worthy of a practical

acquaintance, and we commend them, with pleasure, to the attention of our readers. Sample prints and price-lists can be had from the American Agents, Ralph Harris & Co., 26 Bromfield Street, Boston, Mass.

A lens booklet somewhat different from the usual price-list comes to our table from the Wollensak Optical Co., Rochester, N. Y. It consists of a series of short articles by well-known photographers, covering the lenses manufactured by the Wollensak Optical Company, and illustrated by the writers of the articles. Copies can be obtained by writing to the Wollensak Optical Company for "The Photographic Quartet."

Our readers will kindly note that the editorial endorsement and recommendation given to Ernest F. Keller, New York City, in these pages some months ago, is hereby withdrawn for good and sufficient reasons.

Something entirely new in dry-plate manufacture is the Spectrum plate just introduced by the G. Cramer Dry Plate Company. This plate possesses a range of sensitiveness to the red which enables one to record the B line (6,870) in the Spectrum with ease, while, with a slightly increased exposure, they extend even beyond 7,000. Unless we are mistaken, this result has not been attainable hitherto except by the use of plates specially bathed, such as the Wratten & Wainwright Panchromatic. These latter are bathed plates, while the Spectrum has the dye included during manufacture.

From a series of tests carried out by an expert, we are informed that the Spectrum plate has greater red sensitiveness than the Lumière Autochrome, while for direct three-color work the exposure time for the "Spectrum" may be taken as six minutes, as compared with the twenty minutes' exposure required by the Seed Panchromatic for the same subject. This is a notable advance, and will be appreciated by all who have to

handle the difficult problems involved in the photographing of color. A descriptive circular with full particulars of the "Spectrum" plate for ordinary and process work may be obtained from the Research Laboratory, G. Cramer Dry Plate Company, St. Louis, Mo.

We have received from the Folmer & Schwing Division, Eastman Kodak Co., Rochester, N. Y., the 1909 catalogue of Graflex and Graphic cameras, a sumptuous brochure describing all the many varieties of these cameras in detail, with illustrations showing their construction and an interesting collection of examples of Graflex work. Among the 1909 novelties, the No. O Graphic camera, the Stereo Auto Graflex, the Revolving Back Auto Graflex, and the 1A Graflex deserves special mention. Those interested in the possibilities of the reflex camera should see this catalogue, which may be obtained from any dealer on request.

We are informed that the new Goerz Folding Reflex Camera, mentioned in THE PHOTO-MINIATURE No. 99, will be introduced into this country at an early date. Particulars may be had on application to the C. P. Goerz American Optical Co., 79 East 130th Street, New York.

A remarkable invention, due to Mr. F. E. Ives, is the Color Film Pack. This is a clever device for making the three negatives for trichromatic photography by one exposure in an ordinary camera, by means of which the ordinary photographer can accomplish this difficult work with complete success, either in the studio or away from it. The color record negatives are made with hardly any more trouble than negatives of the ordinary sort. The great possibilities of Color Film Pack are obvious and, with the rest of the world, we are impatient to see this invention made commercially available. The Color Film Pack is controlled by Ives Inventions, 939 Eighth Avenue, New York. Further particu-

lars are promised within a short time. This company has also introduced The Magic Colorscope, showing perfectly clear transparent phantom impressions on glass as strong and vivid as color photographs, the colors of which may be made to appear either true to Nature or to show kaleidoscopic changes. This instrument was awarded the John Scott Legacy Medal by the Franklin Institute, Philadelphia. Price in mahogany, with four slides, $3.50.

Those who are interested in the revolution in three-color process work for the illustration of catalogues, text-books and the like, accomplished by the introduction of the Lumière Autochrome plate, should write to the McFarland Publicity Service, Harrisburg, Pa., for a copy of "Orders" No. 3, which contains some remarkable examples of three-color work from autochrome color records.

The publication of THE PHOTO-MINIATURE No. 98, "Stereoscopic Photography," brought to our table an old invention worthy of note in these pages. This was the Gem Stereoscope, a collapsible stereoscope folding neatly into a case measuring 7¼ x 3¾ x 1½ inches. It was invented by Mr. Vernon Royle, of Paterson, N. J., in 1870, but has not been placed on the market. When set up for use, the Gem Stereoscope resembles the Lothian Stereoscope illustrated on page 56 of THE PHOTO-MINIATURE No. 98, but possesses several features which make it a decided advance on that instrument. The card holder folds down upon the slide extension; the lenses are adjusted to any desired separation by simply turning the handle of the instrument, and may be locked in any position by the turn of a lock-nut. This adjustment is accomplished by means of cross levers connected with each lens. The usual hood of the everyday stereoscope is replaced by a metal frame of light construction, so arranged that one of the eye-pieces with its lens turns and fits snugly within the frame for portability and space saving. The eye-pieces

are turned hard rubber cells, the lenses being removable. A neat morocco leather cap is attachable at will to each eyepiece. The instrument is very light and convenient in use and, apart from its historical interest, reflects great credit upon its inventor. It would, undoubtedly, be widely appreciated if commercially introduced, by the thousands of new workers who are now taking up the practice of stereoscopic photography.

A new market for photographs illustrating rural life is opened up in the offer of "Farm and Home," Springfield, Mass., to pay for accepted photographs of this class.

Just within the main entrance to the great lens factory of the Bausch & Lomb Optical Co., Rochester, N. Y., there has been erected a memorial in testimony of the love and affection of the employees of this Company for the late Henry Lomb. The memorial is a bronze tablet bearing the legend: "Think of Others First, Yourselves Afterwards," taken from the last public utterance of Captain Lomb. This rests upon the capital of an Ionic pedestal of polished Siena marble. The exercises for the unveiling of the memorial were attended by the almost two thousand employees of the Company, together with the surviving members of the two families of Bausch and Lomb.

Books and Prints

All books noticed in these pages may be obtained from the publishers of THE PHOTO-MINIATURE, and will be promptly forwarded, postpaid, to any address on receipt of the publishers' prices as here quoted.

The Photographic Annual, 1909, incorporating "The Figures, Facts and Formulæ of Photography." A guide to their practical use. Edited by H. Snowden Ward. 5th edition; extended, largely rewritten, and revised to June, 1909. 287 pages; paper covers 50 cents, postage 8 cents; cloth bound, interleaved with writing paper, $1, postage 10 cents. New York, Tennant and Ward.

This useful volume makes a twofold appeal. First, to those who possess *The Photographic Annual, 1908*, of which this is a new and thoroughly revised edition; and, second, to those who, knowing nothing of the previous editions, are still seeking for a handy book of photographic reference covering their everyday needs. For many years *The Photographic Annual* was widely sold under the title of *Figures, Facts and Formulæ of Photography*, and was received with general praise as filling a long-felt want. In the present edition, well-known features of *Figures, Facts and Formulæ of Photography* are retained, but with new information in every section and some features peculiar to the *Annual*. Briefly, the book consists of almost 300 pages, closely packed with carefully selected formulæ, working methods, tables and short cuts, covering almost every practical application of photography and process work. Added to these, we have a 64-page Glossary of photographic terms and phrases. It is unlike any other Annual in that it contains no miscellaneous papers or illustrations; for which reason it will doubtless be preferred by many as the ideal photographic yearbook. We recommend it to the photographic worker with pleasure, as emphatically the best compilation of its kind.

We are informed by the English publishers that *Photograms of the Year 1909* is so far advanced that it will be published a month earlier than usual. It is hoped to have the American edition of this yearbook of pictorial photography ready for delivery by the end of October. As usual, *Photograms of the Year 1909* will reproduce about two hundred of the best pictures of the year, some from the great exhibitions and others from the portfolios of noted pictorialists. These will be accompanied, as in past years, by critics upon a progress shown during the year by the American, British, French, German, Spanish, Australian, Canadian, South African and Belgian schools. As *The British Journal of Photography* says: "Do you want a pocket Salon, a portable R. P. S., and a tabloid European and colonial exhibition, all rolled into one? Then buy *Photograms of the Year*.

The Telephoto Quarterly No. 6 is quite up to the preceding numbers in variety of interest and usefulness to the telephotographer. F. C. Lees has an article on "Telephoto Exposures" which simplifies this problem. "Telephotography as an Aid to the Picturesque," by E. A. Biermann, with illustrations; "Convertible Negative Attachments;" "Three Telephoto Snap Shots," with some account of their making; "The Diaphragming of Telephoto Lenses," and an editorial review of new telephoto apparatus and novelties, complete the issue. Among the special illustrations, we note a clever example of Alpine telephotography, by Dr. Atkins Swan, a prominent member of the Alpine Club and a veteran in telephotographic work. American agents, Tennant and Ward, New York. Subscription price, 75 cents per year.

H. Snowden Ward, Esq.
B. J. Falk

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EDITED BY JOHN A. TENNANT

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Photographic Chemicals

The chemistry of photography is a subject big with interest, but the mastery of it leads along a tedious and dusty road, which few of us have either the time or inclination to travel. Moreover, in everyday photographic manipulation, a little practical knowledge of a few chemicals and their intelligent use will go a long way in the avoiding of mistakes and reaching successful results in our work. This monograph aims to be wholly practical. It is written from the viewpoint that the reader would rather know that the accidental scattering of pyro dust on the workroom table will give spots on his prints than that pyro is tri-hydroxy benzene. Therefore it will not present the materials used in photography on any chemical plan, but will group them according to their actual use in everyday photographic work, so that the reader can readily find the essential facts in making up his solutions and otherwise preparing for darkroom or workroom manipulation.

Following this plan, we will consider first the chemicals used in development, then those employed in the various printing, toning and fixing processes, for reducing and intensifying with the after treatment of the negative, for mountants and two or three other processes frequently employed. In this way we will gain at least an intelligent understanding of the more important chemicals used in photography, their significance and how to compound and use them in working for definite results. This knowledge will be useful, not merely in the making-up of the formulæ which are so

profusely offered in our journals and textbooks, often without explanation or comment, but also in the choice of this or that formula as compared with another, as better adapted to give us the particular result we have in view, or for a special purpose.

Chemicals in Development

Pyro is the most readily soluble of all developers, and the one which shows most strongly its unfitness for further use by the darkening of the solution. The best form in which to purchase it is "crystal," not the "re-sublimed" and bulky variety. The latter is inconvenient to weigh out and is easily blown about, and spots on bromide and other prints are often traceable to settlement of pyro scattered in the darkroom in weighing out. "Crystal" pyro is simply a heavier variety: It is not a mixture of pyro and anything else, and is in all respects equal to the "re-sublimed." Pyro is most generally used with crystallized soda carbonate (sal soda or washing soda) as the accelerator. Ammonia is now less frequently used. Caustic soda *can* be used if an exact proportion be taken of 34 parts to every 100 of pyro: The result is a soft working developer producing detail quickly after the manner of metol. Pyro developer is always kept in two solutions; i. e. the pyro and a preservative as No. 1, the accelerator as No. 2, the two being mixed just before use. It is exceedingly elastic in use, giving negatives of any desired character according to the modifications introduced in its make-up by the individual worker. For example: With a minimum of alkali, it gives negatives strong in contrast; with a larger amount of alkali, the negative will be softer in gradation and more harmonious in printing quality. Similarly, the color of the pyro-developed negative can be very considerably influenced by the amount of sulphite used as the preservative, and so on. These details can readily be mastered by a few experiments or a careful reading of such textbooks as Watkins' *Manual of Exposure and Development*, in which the variations of result by modifications in the developer are clearly set forth.

Hydroquinone is not very soluble, only to the extent of 5 per cent in cold water or sulphite solution, and therefore it is best to use warm water in making it up.

The best alkali for use with hydroquinone is caustic potash or soda: The carbonates of soda or potash give a rather slow-acting developer. Hydroquinone keeps well even in single solution; in general use it tends to give strong negatives, clear and free from fog, and is not so easily modified as pyro.

Metol is always used with soda or potass carbonate: It keeps well single- or two-solution form, giving soft negatives, and is generally considered to be the developer par excellence for short-exposure work. As a usual thing it is combined with hydroquinone, this giving more desirable contrasts. For development papers, metol-hydroquinone is almost universally employed because of its clear-working, non-staining properties.

Diamidophenol, sold as Amidol and under other names. Soluble to the extent of 4 per cent in cold water. Used with sodium sulphite only (no alkali), forming a universal developer for plates and papers, it gives a cold, blue-black image, free from fog, which "fixes out" somewhat more than is common with other developers, hence development should be pushed a little.

Pyrocatechin, a very soluble substance, 80 parts in 100 of water. Used either with carbonate or caustic alkali, and in each case keeps well as a single-solution developer.

Glycin, very stable in solution, used with potass carbonate as a rule. It is about the slowest developer in action, giving negatives of fine grain.

The Sulphites

A sulphite of some kind or other is universally used as a "preservative" of a developer. It retards the spoiling or oxidation of the developer. It does not, however, wholly prevent oxidation; sooner or later the developer, even with sulphite, ceases to exert a sufficient developing power. The length of time it retains its activity depends on the developer, on the quality and quantity of the sulphite, and on the manner of preparing and storing the solution. Some developers which are preserved by sulphite also preserve it: i. e., the mixture keeps much better than either constituent alone. Hydroquinone is an example of this. The forms in which sulphite may be purchased are soda sulphite (cryst and anhydrous),

potass metabisulphite, sodium acid sulphite (usually as a liquid or "lye"), acetone sulphite, and sulphurous acid (the latter only as a liquid). Of these, "soda sulphite cryst" is by far the most largely used; next, perhaps, potass metabisulphite, though "acid sulphite" is now coming considerably into use.

The two forms of soda sulphite. Soda sulphite cryst contains half its weight of real soda sulphite (Na_2SO_3), the other half being water of crystallization ($7H_2O$), that is to say, the chemical formula of the crystals is $Na_2SO_3.7H_2O$. As commercial samples go, the anhydrous sulphite is not usually quite double the strength of the cryst, but it is near enough to take double the weight of "cryst," instead of a given quantity of "anhydrous," or half the weight of "anhydrous" for a given weight of "cryst," and when this proportion is adhered to there will be no appreciable difference in the developers so far as the sulphite is concerned.

Soda sulphite cryst should be in clear, transparent crystals. If it is opaque, with a white crust or powder adhering to it, it is a sign of bad manufacture or of long keeping. The deposit is sulphate of soda. This has no seriously injurious effect on the developer, but its presence shows that the sulphite is not of full strength, and a developer made up with a sulphite of this kind cannot be expected to keep so well as one compounded with the highest grade fresh sulphite, nor will it do the same work. Sulphite becomes converted into sulphate both when solid and when dissolved, though more rapidly when in solution. But the solid should be kept well corked and in a dry place. Sulphite crystals which have become whitish can be made clear and bright by rinsing them with cold water. Simply put a fair quantity in a clean measure, sprinkle a little water over them and shake round for a few moments. The cleared and wet crystals are then turned out onto a dry, clean cloth or onto blotting-paper, and the adherent water mopped off before weighing them out. This, of course, wastes some sulphite, but it brings a sample which has "gone off" into the best condition.

One little point which may puzzle the careful worker is the curious change in appearance which sulphite crys-

tals will undergo when placed in very hot water to dissolve: they will suddenly become quite opaque and powdery, owing to the heat causing a change into the anhydrous form. There is no occasion to suspect impurities—the transparency of the crystals before solution is the mark of purity—for the very best sulphite will behave in this way.

Keeping Sulphite in Solution

Chemically, soda sulphite is a neutral salt, i. e., there is combined in it as much soda as the sulphite acid (sulphurous acid) will take up, but actually (to litmus paper) it is alkaline. It will keep very much better in solution if the solution is made neutral or slightly acid. The best substance to use for the purpose is potass metabisulphite, which is itself acid with sulphurous acid. About one quarter the weight of sulphite is usually necessary to obtain a neutral solution. Litmus paper may be used to show when to stop adding metabisulphite to the sulphite solution,—the paper is blue at first and turns red when the alkaline nature of the sulphite has been overcome,—but, as a little excess of metabisulphite is no disadvantage, it is almost as satisfactory and more convenient to make up a stock solution by formula as follows: Soda sulphite cryst, 4 ounces; potass metabisulphite, 1 ounce; water, 20 ounces.

This stock solution of "neutral sulphite" can be used for making up almost every developer, and it will give far greater keeping powers to the solution than sulphite alone. Mr. Welborne Piper, to whom the observation is due, has used it for preparing a pyro-developer which keeps for months and works without stain. For obvious reasons the practice of putting sulphite and alkali such as soda carbonate in the same solution, which is still adopted in some developing formulæ, does not favor the retention of the properties of the sulphite which very rapidly oxidizes in these conditions.

The above is not the strongest sulphite stock solution which can be made. Although authorities tell us that cryst sulphite will dissolve in water only up to 25 per cent, i. e., 2½ ounces in 10 ounces of water, it can be

got to dissolve up to 50 per cent. i. e., 5 ounces in 10 ounces of water; but this very strong solution is apt to deposit the sulphite in cold weather or when mixed with the potass metabisulphite.

Anhydrous Sulphite

Anhydrous (i. e., water-free) sulphite is used largely on the continent of Europe, chiefly in France, owing to the fact that an excellent make is supplied by the firm of Lumière. It is said to keep better in the solid state than the crystal, but in solution there is no difference between the two. Roughly, one part of anhydrous may be replaced by two of "cryst." It can, of course, be obtained from large manufacturing chemists.

Potass Metabisulphite

This is an acid sulphite,—that is, contains an extra proportion of the sulphite acid (sulphurous acid). This makes it richer in sulphurous acid (it contains 54 per cent against the 26 per cent in cryst soda sulphite), and therefore a much smaller quantity can be used in a developer, apart from the fact that the acidity of the metabisulphite is a further preventative of oxidation, in the case of pyro at any rate. It may be said that a pyro solution should have four times its weight of neutral sulphite, but it will be better preserved in solution with its own weight of metabisulphite, that is, one-fourth the quantity. When metabisulphite is used alone in this way in place of sulphite, some little allowance must be made for its acid nature; or the developer may be put down as slow or restrained, simply because the metabisulphite has neutralized part of the alkali. For every ten grains of metabisulphite present in the developer as applied to the plate, extra alkali needs to be added as follows: Soda carbonate cryst, 10 grains; or potass carbonate, 6 grains; or caustic soda, 3½ grains; or caustic potash, 5 grains.

But the need of making calculations of this kind is avoided by preparing the neutral mixture of sulphite and metabisulphite described above. Metabisulphite should on no account be dissolved in hot water, as part of the sulphurous acid is thereby driven off. Metabisulphite is also the best material to use in preparing an acid fixing bath. (See under Hypo.)

Iris
K. Theodor Krantz

Indian Pipes
Margaret Bodine and Nina Lewis

Acid Sulphite, or Bi-sulphite This is a substance which does not keep well in the solid state. The best form in which to purchase it is as a solution or "sulphite lye," which is supplied of specific gravity 1.34, containing 8½ ounces of soda acid sulphite ($NaH.SO_3$) in every 10 ounces. Comparatively small quantities of this solution serve for the preservation of pyro and other developers in solution; one-half dram being found by M. Lumière sufficient to preserve 35 ounces of 50 per cent pyro solution. Such a quantity is so small that the acid sulphite has practically no effect in neutralizing alkali; but, apart from this, it has been found advisable to prepare a neutral sulphite liquor from the acid sulphite, since much better keeping properties are secured. A convenient method of doing this is to dissolve 1¼ ounces of cryst soda sulphite in 4¼ ounces of water and add 2½ ounces bisulphite liquor. Every 10 ounces of this mixture will contain 1 ounce of sulphite and 3¼ ounces of bisulphite liquor. The value of these neutral or nearly neutral preparations of sulphite has not been properly recognized in the past. My own experience has been confined chiefly to that of sulphite and metabisulphite already mentioned, but the mixtures prepared with acid sulphite liquor are proving equally valuable as preservatives of developers. Thus, a developer for use with plates, papers and lantern slides is prepared by adding two drams of the above bisulphite-sulphite mixture to 5 ounces of water, from one-half to one dram bisulphite liquor, 15 grains of diamidophenol (dry) and bromide, as may be necessary, from a 10 per cent solution. The mixture can also be used for pyro, hydroquinone and other developers used with alkalies, as directed in a later paragraph. At present formulæ are not very numerous, but it is to be hoped that readers of THE PHOTO-MINIATURE will experiment for themselves with these modern substitutes for sulphite or metabisulphite pure and simple.

Sulphurous Acid The root substance of sulphites, but not of much value in practical photography. It is a solution of the gas SO_2 (sulphur dioxide, as it is called, or often "sulphurous acid"). It has a specific gravity of 1.046, and, if of

this full strength, contains 9½ parts of real SO_2 per 100 parts (by weight) of the liquid. Thus, it is a far weaker preservative than metabisulphite, and, as it is also a strongly fuming and irritating liquid, it need not be further considered, although it was much in favor in the old days and is still used in the "Beach" potash developer by those who favor this formula.

Acetone Sulphite

A compound of soda sulphite and acetone containing when pure 46 per cent of SO_2, that is 8 per cent less than potass metabisulphite. It can be used instead of sulphite or metabisulphite as a preservative, and may also be used with developers (amidol and diamidophenol) which work without alkali. It decomposes if dissolved in warm or hot water, giving off sulphurous acid gas. Owing to its faintly acid properties, it acts as a restrainer with pyro and with other developers; but it cannot be said that the far-reaching claims made for it on its introduction, either as a preservative or restrainer have been confirmed generally in practice. Next to sulphurous acid, it is the least useful of the sulphite chemicals.

Having thus set down the chief properties of the sulphite substances used in photography, chiefly in developers, we may now pass to the equally important bodies whose function is to give energy to the developers, viz: the alkalies.

Alkalies

In chemistry, the chief business of alkaline bodies is to neutralize acids, forming salts. Their action of energizing a process such as the development of the photographic plates is one which they are called upon to exercise far less frequently. Therefore chemical tables of equivalence of the alkalies (being based on their respective powers of neutralizing acids) do not necessarily hold good in photography. For example, from the purely chemical standpoint, ten parts of crystallized soda carbonate may be replaced by (practically) two and three-fourth parts of caustic soda. So far as the neutralization of an acid is concerned, the result would be precisely the same, but the effect of using four ounces of caustic soda instead of ten ounces of soda car-

bonate cryst in a pyro developer would be to produce fog on every plate. All the alkalies are alike in being very soluble in water, those of potash considerably more so than the soda alkalies. The solutions attack glass and therefore alkalies, particularly the "caustic" alkalies, cause a glass stopper to stick in the neck of a bottle, which is therefore best closed by a rubber stopper. The solutions also attack the skin: caustic alkalies in strong solution will corrode clothes, etc., with which it comes in contact. The test for alkalies is red litmus paper which is turned blue by them: acid restores the red color. One or two books of red and blue litmus paper should be kept in the darkroom, for use when it is required to make a solution faintly acid or alkaline.

Of the two classes of alkalies—caustic and carbonated —the former are much more powerful agents. Ammonia, caustic potash and caustic soda are the chief caustic alkalies, or hydroxides (i. e. hydrates), as they are called by chemists. They may be used with some developers—notably hydroquinone and pyrocatechin. They are powerful solvents of grease, fats, etc. (cleansing agents), and strongly affect the skin.

Soda Carbonate

This is by far the most largely used of the alkalies employed for photographic purposes. It is generally purchased in the crystallized form, sold commercially in the United States as sal soda, in England as washing soda, and in both countries as soda carbonate cryst (or granular). The formula of the pure crystals is $Na_2CO_2.10\ H_2O$, but the salt is apt to lose some of these 10 molecules of water if kept in a dry atmosphere, and thereby exceeds its normal strength of 37.1 per cent dry or anhydrous sodium carbonate (Na_2C_3O). Dr. C. W. Miller, some time ago, in a paper before the Photographic Society of Philadelphia, gave results of analysis of crystals in which the real soda carbonate was as much as 43.5, 50.5 or even 68.6 per cent. Such increase of strength is not met with in England : on the contrary, washing soda sold by drug stores (dry-salters) is often adulterated with Glauber's salts (soda sulphate) to an extent which brings the percentage of soda carbonate down to 30, 20 and 14 per cent. Such impure samples of soda are quite

useless for making developers. The moral of this is that, in order to ensure getting carbonate of proper strength, it is necessary to purchase a reputable brand sold properly bottled or sealed. The Seed carbonate styled "Chemical pure" is perhaps the most reliable brand in this country (United States), and there are several standard makes of bottled carbonate in Britain. The soda sold loose at the stores may be of proper quality, but it is not possible to rely upon it. The cheaper carbonate will not make a bright solution in distilled water, as will the pure varieties. When ordinary tap-water is used, it may happen that the purest carbonate will give a turbid solution, as it throws down some of the lime, etc., in the water. The best course is to allow time for this to settle, and pour off through a filter paper into another vessel. The carbonate will dissolve to a 50 per cent solution (5 ounces in 10 ounces), and hot water can be used to hasten the process.

Dry Sodium Carbonate

This is the anhydrous (i. e., water-free) form of soda carbonate, but is little used. It is sold as a fine white powder, which must be kept well stoppered, otherwise it loses strength by absorbing water. It can be brought back to full strength by heating in a basin over a gas burner or spirit-lamp, and some workers prefer to use it on account of being thus able to ensure its strength. In England, "dry" or "dried" carbonate has to be purchased from the larger chemists' supply houses, and may be depended upon for purity; but, after all, to buy the "dry" salt is a more expensive way of getting carbonate than purchasing the crystals.

Both forms of carbonate must be distinguished from bi-carbonate of soda ($NaHCO_3$), which is often sold by grocers and druggists as "carbonate of soda." It is a fine white powder, totally useless for development, and employed in photography only in gold toning baths, or sometimes as a stop-bath for checking the action of an acid solution and other minor purposes.

Potassium Carbonate

This form has the advantage over soda carbonate of much greater solubility, but unfortunately is less definite in strength. The best plan is to purchase the pure "dry" or "anhy-

drous" carbonate (K_2CO_3) in quantity sufficient for immediate use as it rapidly absorbs water and becomes pasty. It can be dried again, but, if it has taken up much water, the operation is troublesome, owing to the "spitting" of the salt under the action of heat. The crystal potass carbonate should be $K_2CO_3.2H_2O$, equal to 79.3 per cent of real carbonate, but may be more or less. With most developers, there is not much reason to prefer potass to soda carbonate. Hydroquinone works quicker with potass carbonate than with soda carbonate, but, as a rule, there is not much difference in practice between the two, and soda carbonate crystals, on account of their more convenient handling, supply the best source of carbonated alkali.

Caustic Potash This is the best caustic alkali for developers, as it is much more soluble than caustic soda. Its formula is KHO, and, though the absolutely pure substance is very costly, the "stick potash" is a very pure form, and quite as efficient for photographic purposes as the "pure" sold in lumps at twice the price. Both varieties absorb water greedily and must be kept closely stoppered. "Stick potash," owing both to its hardness and the rapidity with which it becomes damp and sticky on the balance, is very awkward stuff to weigh out in exact quantities, and therefore it is much better to put a stick or so on the scale to somewhere near the weight required, and then (instead of worrying to break off tiny fragments) to find the weight of the portion on the scale, and use more or less water to obtain a solution of the requisite strength. Thus, supposing we are making up a hydroquinone No. 2 solution and want to dissolve 200 grains caustic potash in 20 ounces, it is much more convenient to put pieces of stick quickly on the balance-pan of greater weight, and then by adding further weights discover that the actual amount is, say, 240 grains. A very simple calculation will show that, as the 200 grains were to be dissolved in 20 ounces (10 grains per ounce), the additional 40 grains requires a total volume of 24 ounces. This avoids the chance of getting holes in one's clothes from fragments which fly off the sticks, and moreover does not give the alkali time to

take up moisture. In dissolving, a good deal of heat is given out, enough to crack a bottle if an occasional shake be not given while solution is going on. It is best to use distilled water to get a clear solution, and the bottle in which either the dry potash or its solution is stored should have a rubber stopper; a glass one will sometimes so stick as to defy removal.

Caustic Soda Sodium hydroxide, or sodium hydrate, $NaHO$, resembles caustic potash, but is less soluble in water. Though both are much more soluble than is necessary for photographic solutions, the caustic potash has the merit of dissolving more quickly than the sodium compound.

Ammonia .880 Ammonia itself (NH_3) is a gas, but the strongest solution of it in water is the familiar "liquor ammonia," of reputed .880 specific gravity. It is this liquid which is meant when "ammonia" is directed in formulæ. Actually, the solution is always a little higher in gravity (.890), and contains but 33 to 34 per cent of real ammonia, owing to escape of some gas. The liquor is a very powerful alkali, and evolves a vapor affecting the eyes, nose and throat. As it rapidly loses strength, it is best to mix the whole bulk purchased with an equal volume of water, and take double the quantity in making a formula. Though many old hands in photography still use the pyro-ammonia developer, it has been largely discarded for pyro-soda, whilst the latter is now in process of being superseded by amidol and similar one-solution developers which are simpler in their manipulation than pyro.

Ammonium Carbonate This is the "rock" or "lump" ammonia of the drug stores, and is a most indefinite body, consisting of a mixture of several unstable salts of ammonia. It should be in large, clear lumps if the best results are to be obtained with it, in practically the only process for which it is used, viz. the making of warm-toned lantern-slides. It is fairly soluble in water (25 per cent), but must not be dissolved in hot water, otherwise a good deal of ammonia is lost; and, of course, it requires to be kept very well stoppered.

Ready for Business
O. C. Conkling

Polo Players
Nathan T. Beers, M.D.

Tri-basic Sodium Phosphate This has been recommended as a substitute for caustic alkalies, especially with the hydoquinone developer. Though chemically a neutral salt, it is actually fairly strongly alkaline; but a good deal of it has to be used in replacement of caustic alkalies, and the advantage is not very marked, so that little use has been made of it. A 20 per cent solution is made and mixed with an equal bulk of a stock solution containing 1 1/4 per cent hydroquinone and 10 per cent sulphite.

Restrainers The bromides of ammonium and potassium are the usual and most effective restrainers in development. Practically every plate can do with a little bromide in the developer, although theoretically there should be none. About one half grain per ounce of developer may be taken as the average addition of bromide to a normal developer. This will have but little restraining effect, but will simply keep the plate quite free from chemical fog,—that is development where there has been no action of light. The more rapidly acting developers, amidol, metol, etc., require more bromide to produce a given amount of action than slow developers like hydroquinone and pyro. Of the two bromides, that of potassium may be used in any formula, the ammonium bromide being only suited for use with ammonia as the alkali, owing to the fact that the caustic and carbonated alkalies decompose it to a partial extent, forming ammonia, and thereby producing, in the case of many developers, fog and irregular action. The only exception to this rule is the case of the developers containing both caustic alkali and ammonium bromide (with often ammonium carbonate), made for securing warm tones on lantern-plates. In this case, the ammonia bromide favors a warmer tone, than that of potass bromide, but for negative work it is well to make a rule to use only the potass compound. Both salts absorb water rather readily, but if they become damp no harm will result in putting them in a dish in the oven to dry, or gently heating over a gas burner. Both salts are very soluble, and it is well to keep them in stock 10 per cent solutions, from which addition may be made to a developer

direct, or, in making up developers, 10 minims of the stock solution is taken for each grain of the developing salt employed in the solution.

Hypo The chemical name of hypo is sodium thiosulphate, $Na_2S_2O_3.5H_2O$, and the chief facts to be borne in mind are: (1) That hypo greatly chills the water in which it is dissolved, and should therefore be made up with hot water, or some time before it is wanted, otherwise the lowered temperature of the bath will render it almost inactive; (2) that hypo requires to be used liberally, since the proper fixation of plates and papers is secured only by forming the double thiosulphate of silver, $Ag_2S_2O_3.2Na_2S_2O_3$, and therefore too weak or exhausted a bath, or too short a time of immersion, will give a film containing a silver salt which readily decomposes. No amount of washing will remedy the harm of scamped fixation, whilst, if fixation be complete, the removal of the soluble salts is a matter of much shorter time than usually imagined; (3) hypo must not be mixed with acids or acid substances which decompose it and give rise to the formation in the films of plates or prints of these same unstable compounds. Nearly every acid will thus decompose hypo. About the only one which will not is sulphurous; but even this acid, mixed with hypo, soon decomposes, owing to the fact that it is easily oxidized into sulphuric acid. The remedy for this state of things is to mix with the hypo and the acid some other substance which will take up the latter, and so shield the hypo from its action. Sulphite of soda or other sulphite will do this, and it is on this basis that the only reliable "acid fixing baths" are prepared. Hypo, sulphite and sulphuric acid (the first two mixed before the last is added) is a common formula, but the best; in practice, it is also the simplest to make up. It is simply hypo and potass metabisulphite. This latter, it will be seen from what has already been said about it, is acid and sulphite in one. It is added to the hypo in the proportion of about one-half ounce to every four ounces of hypo, the only precaution which needs to be taken being to have the solution cold or only luke-warm when adding the metabisulphite. This acid fixing bath will

keep clear and white as long as it retains its fixing properties, which is a great advantage in the case of plates, but of doubtful value for paper prints, the completeness of fixation of which cannot be judged at all from their appearance. In the case of these latter, it is a safeguard to have the fixing bath turn dark after much use, since this is some (though a very rough) indication that it is becoming exhausted. Most "gaslight" papers require an acid fixing bath and for them the above formula is very suitable.

Hypo Eliminators

Several substances are used for the purpose of destroying the hypo in prints or plates after fixing, though in the case of negative and bromide prints it is really doubtful if the compounds into which the hypo is converted are less harmful than hypo itself. In the case of gelatine and collodion prints, the image in which is more susceptible to chemical influence, it may be unsafe to assume that traces of hypo may be left in prints with impunity; and so also is it in regard to negatives which are to be intensified with mercury and other means. But in all these instances the best and safest hypo-eliminator is water, applied so that plates or prints get a series of soaks, alternating with complete draining off of the water. However, chemical destroyers of hypo, such as potassium percarbonate, potassium persulphate and potassium permanganate, deserve to be mentioned. The latter is the cheapest of the three, and for negatives the most simple in use, since the color of the permanganate makes it also an indicator of the completion of its destructive action upon the hypo. A little of the permanganate is kept as a deep purple solution, a few drops of which is added to water so as to color it faintly pink. The negative is given a wash under the tap of one minute, and placed in the pink solution until the color is discharged, which will be a second or two only. It is then put in a second similar bath, and into still a third if the color in No. 2 goes pretty quickly, say, in less than twenty seconds. This cheap and simple process will rid a negative of hypo within three minutes of taking it from the fixing bath. The weak pink solution of permanganate may be used as a test for hypo remaining in

prints. Add a few drops to water in which the prints have been put to soak; if there is hypo, the pink color will be destroyed.

Toning Chemicals

Gold Chloride.—The chemical formula of the pure salt is $AuCl_3$, but the yellow crystals sold for toning purposes have the composition $AuCl_3.HCl$,—that is, they are combined with a certain amount of hydrochloric acid, which is not the best substance to have in a toning bath, even in minute quantities. The yellowish brown chloride is more nearly the pure gold chloride. In making up the stock solution of the gold in a 15-grain tube, the latter is broken into a measure, distilled water added to the two-ounce mark, and stirred until a clear solution is obtained within a second or two, as the gold is highly soluble. The greatest cleanliness is needed here, since gold is readily thrown down from its solution by any kind of organic dirt, e.g., paper, bits of cork, or impurities in water. On this account, distilled water and a glass-stoppered bottle made perfectly clean should be used.

Potass Chloroplatinite

This salt is $PtCl_2.2HCl.6H_2O$, and therefore acid; but this is not a drawback, as the salt is invariably used in acid solution for platinum toning. A stock solution is made in the same way as that of the gold, and requires the same precautions. In toning baths, the platinum is most usually used with phosphoric acid. The well-known and reliable Aristo platinum solution is advised for this purpose as a standard preparation.

Ammonium Sulphocyanide

Gold chloride alone will not tone a print properly. It requires a substance with it which will absorb the chlorine which is liberated in the toning process. Ammonium sulphocyanide is the substance now most largely used for this purpose. It is supplied in clear white needle-shaped crystals, which absorb water very greedily and quickly spoil if exposed to the air. Sulphocyanide which has thus suffered cannot be put right by any drying process, as heat converts it into other substances. It is best to make up a fair supply in a 10 per cent solution, which will keep for weeks or a month or two.

In mixing with the gold chloride, there is one right way, viz., to add the gold solution, a very little at a time, to the sulphocyanide. At each addition, there will be a momentary reddish color, which disappears again instantly, leaving a water-white solution. If the sulphocyanide solution be made quite hot, by using boiling water for diluting the 10 per cent stock solution, the toning bath will be ready as soon as cold ; but, if the mixture is made with cold water, the bath requires to stand for a few hours to "ripen" for use. The object in each case is the formation of the sub-sulphocyanide of gold, AuCNS. It should not be forgotten that sulphocyanide exerts considerable solvent action on silver bromide and chloride. It is a fixing agent, quite powerful enough to be practicable (apart from cost), and therefore any excess in a toning bath may have the harmful effect of partially fixing a print before it is toned.

Phosphoric Acid

This acid, H_3PO_4, prescribed in platinum toning formulæ, is purchased as a syrupy liquid which contains about 90 per cent of the real acid. It should have a specific gravity of 1.75. As already mentioned under "Hypo," traces of these acids in the fixing bath will give rise to sulphur compounds in the film, and, in the case of collodion papers, are a certain cause of spotted and yellowed prints. It is essential to recognize that the platinum bath is acid, and therefore the prints must be thoroughly washed between toning and fixing, or passed into a bath of sodium bicarbonate, or carbonate in which the acid will be neutralized.

Sodium Sulphide

This compound, Na_2S, has latterly come into importance for the toning of bromide prints by what is known as the sepia or "sulphide" method. Its purity and proper conditions are the chief factors in the success of the process. The "chemically pure" sulphide is in white crystals; that sold as "commercial pure," in lumps of greenish or yellowish color. Both are very absorbent of water and required to be kept well stoppered. Both will give good tones, those with the pure sulphide being more purplish than those of the "commercial pure." The solution of the latter requires to be filtered before use,

and it is all the better to bring the liquid to a boil before filtering, in order to ensure the complete precipitation of the iron and other impurities. In the case of C. P. sulphide these precautions do not need to be taken. Both forms keep fairly well in strong solution, 10 or 20 per cent, but, in the weak solution of one per cent which forms the sulphiding bath, they rapidly decompose, hypo being one of the products which is formed. The tone obtained gradually changes as this decomposition goes on, and therefore the weak sulphide bath should be made up fresh for use and discarded when a batch of prints has been put through it. Both weak and strong solutions of sulphide are never quite free from the objectionable odor of the sulphuretted hydrogen, the emanation of which will discolor printing papers and cause fogginess in plates with which it comes in contact. Sulphide, solid or liquid, should be banished from the darkroom or from any place where photographic materials are stored.

Ammonium Thiomolybdate

This compound $(NH_4)_2MoS_4$, a double sulphide of ammonium and molybdenum, has been introduced by Mr. Harry E. Smith as a substitute for sodium sulphide, and has the very great advantages over it (1) that it is almost odorless in solution, and (2) that a solution, containing ammonia, of the strength used for toning, will keep for at least six weeks in working condition. Moreover, a print toned with thiomolybdate has a little more pluck than one for which sulphide has been used. The use of thiomolybdate is protected by patent, the special preparation being supplied by the firm of H. Edmund and Co., Ezra St., Columbia Row, London, E. The bleaching bath employed in the sulphide toning process is composed of ammonium bromide and potass ferricyanide (which see).

Reducers and Intensifiers

Potassium ferricyanide. The crystals of this salt ($K_6Fe_2(CN)_{12}$, or red prussiate of potash) should be clear ruby-red, free from powdery appearance. The latter feature is due to exposure to light, but the salt can be brought into good condition by rinsing with a little water and drying before weighing out. The solution is

Hurry and Leisure
Mrs. D. Mahony

Mistress Mary
Helen W. Cooke

best kept in the dark. In both toning and reduction, the part played by ferricyanide is to oxidize the silver image to silver ferrocyanide, or, if bromide is mixed with the ferrocyanide, to a mixture of silver bromide and ferricyanide. In the case of the Farmer reducer, the silver ferrocyanide is dissolved, as fast as it is formed, by the hypo in the solution.

Iodine This element is used in a similar way. It oxidizes the silver image to silver iodide. A mixture of iodine and cyanide thus forms a very cleanly though highly poisonous reducer. In making a solution of iodine, the most usual method is to use potass iodide. Cover the weighed-out iodine with about three or four times its bulk of potass iodide and sprinkle with a *little* water. The iodine will at once dissolve. If a somewhat weak iodide solution be employed, there is often a good deal of trouble to get the whole of the iodine into solution.

Mercuric Chloride Also known as bichloride or perchloride of mercury, $HgCl_2$. It is a very hard, heavy salt, requiring to be finely powdered before dissolving. Only slightly soluble in cold water but readily in hot. The solution used for intensification should be made with hot water, allowed to cool, and the clear liquid poured off from the crystals which separate out, these latter being kept in the bottle for use another time. Mixed with an equal weight of ammonium chloride, it dissolves readily even in cold water. The stock solution should have hydrochloric acid added to it to the extent of about two minims per ounce. The acid should not be added until the solution has been poured off from any undissolved salt, otherwise, owing to its solvent powers, it produces a mercury solution which is too strong and is apt to cause net-like markings on the negative. Like other mercury salts, the bichloride is highly poisonous, even when absorbed through the skin. Mercuric iodide, used in the excellent Lumière intensifier, is made by adding potass iodide solution to a solution of mercuric chloride until the precipitate first formed is re-dissolved. This solution is then added to one of sodium sulphite to form the one-solution intensifier.

Potass Bichromate $K_2Cr_2O_7$ is practically the only substance employed in the carbon process, its function in this and other processes being to render gelatine and similar bodies insoluble when exposed in contact with them to light. The stronger the bath in which tissue is sensitized, the greater the sensitiveness, but the softer the prints obtained. Bichromate solution is an irritant poison when taken internally, and when absorbed through the skin causes watery pustules which give rise to peeling in these places. This bichromate disease (well known to carbon workers), is largely a personal idiosyncrasy, some workers being quite immune to it. The salt is also used as an oxidizing agent in toning processes, as is ferricyanide. A solution mixed with hydrochloric acid converts the silver image into silver chloride. Negatives bleached in such a solution and re-developed are intensified, and this process, due to Mr. Welborne Piper, is about the most permanent method of intensification, and has the advantage of being capable of repeated application to the negative in case the first operation does not give sufficient density.

Mountants In making up a starch mountant, the starch should be a perfectly white powder, without taste or smell, and perfectly neutral to litmus paper. The prepared starch of the laundry is not so suitable for mounting purposes as this chemically pure product. When treated with water, the granules of which starch is composed swell and at last burst, forming the jelly-like mixture known as starch paste. Practically every kind of starch, that is, from whatever source, undergoes this change below the temperature of 212 degrees Fahr., nevertheless it is often directed to boil the starch mixture when making paste. If the following directions be adhered to, the starch will jellify perfectly without boiling: Mix the starch with a very little water, enough only to make a very stiff paste, requiring quite hard work with a fork to stir it. Into this mixture pour water absolutely boiling from a kettle. Stir well and the starch will jellify, and may be diluted down with the hot water to any desired consistency. A little glycerine added to this starch paste will prevent its

drying and caking, and some methylated spirit will prevent it from going moldy. But, for mounting purposes, it is far better to use the freshly made starch paste, which is certain to be purer and has better sticking powers than any preparation.

Gelatine The adhesive constituent of glue, and of indefinite composition. It keeps for years if dry, but when damp or in solution speedily alters, becoming first acid and then alkaline and losing its stickiness. Gelatine swells up in cold water without dissolving, but goes into solution when the mixture is warmed.

Some substances will form a cold solution of it, e. g., nitric acid, the base of the so-called liquid glues, which are quite unsuited for photographic purposes.

A liquid gelatine mountant which is of service for prints is made by swelling 2 parts of gelatine in 6 parts of cold water dissolving by heat on the water-bath, adding one part of chloral hydrate and heating again and finally adding a few drops of sodium carbonate solution, to form a neutral mixture. Like starch, gelatine may be kept in a proper condition by an antiseptic, such as Columbian spirit.

Making up Solutions So far we have dealt with the properties of the chief photographic chemicals which concern the customary operations of negative-making and printing. In making up these substances into working solutions, there are a few details which require to be mentioned for the benefit of those who may be under the impression that such work involves a good deal of labor and care and offers opportunities for mistakes which will render ineffective whatever pains are taken in other parts of the process. Certainly we have no desire to suggest that any slipshod way of compounding developers or other solutions will answer, but, on the other hand, a good deal of time may be wasted in needless precautions which are without any benefit so far as the final result is concerned. Thus, the object of the present notes is to emphasize the chief ways and means of preparing properly and correctly made solutions, ready for use, among which methods are to be numbered the cleaning of the stock bottles,

some knowledge of equivalents of weights and measures, of how to powder and weigh out the chemicals, the means which may be employed in certain cases to accelerate solution, and equally when such means should not be employed.

Cleaning Bottles

Bottles newly purchased will usually want little more than rinsing out with water only. Both for them and those which have been in use previously for (usually) unknown solutions, it is well to keep a bottle of commercial hydrochloric acid in the darkroom. Mix it with an equal volume of water and use it over and over again, returning to the stock bottle each time. It will dissolve and remove any impurity (including hypo) which is easily removable. If the bottle looks dirty after one shaking up with the mixture, throw it away; it is not worth wasting further time over it. After the acid, fill up the bottle to the neck with water (to expel vapor from the acid) once; give three rinsings with water, set to drain, and the receptacles for the solutions will be as chemically pure as you require to make them.

Label before Filling

I would urge that the labels for solutions be written out and stuck on the bottle before the chemicals are weighed out. If a practice is made of this, there will never be found in the darkroom those unlabeled bottles, the contents of which are sometimes "identified" by memory, not always with satisfactory results and often leading to waste of solution. Any cheap *thin* paper, secured with ordinary paste, will stick better than the purchased gummed labels, which are often of stouter substance and require a stronger adhesive than they are provided with; but, if a permanent job is to be made of label on a bottle, the best plan is to use such stouter paper and, when the label is dry, give a coating of size (gelatine dissolved in hot water so as to form a thin solution.) When this again is dry, give a coating of transparent oil varnish, so-called "church varnish."

Formulæ

Writers in photographic books and magazines, in some cases, are particular to prescribe that the chemicals in a formula shall be dissolved in water and the total bulk

made up to such and such a number of ounces. Thus they will write: Water, to make twenty ounces. In other instances no such phrase is used, and the presumption is that the chemicals are to be dissolved in the quantity of water specified, the total volume obtained being somewhat greater than this. While it is just as well to follow instructions in this respect, it is not once in a hundred cases that any appreciable difference will result from neglecting the distinction. It requires a more delicate test than the photographic plate to distinguish between the strengths of solution in the two cases.

Weights and Measures

Formulæ in the English language are understood to be made up by apothecaries' weight, that is to say the dram (or drachm) is equal to 60 grains, whilst the scruple (little used now) is 20 grains. The ounce (apothecaries') contains 480 grains, but in most formulæ it will be found that when ounces are mentioned the qualification "Av" is appended, meaning the avoirdupois ounce of 437½ grains. So common is this that I think it most likely that in all formulæ the intention is to use avoirdupois ounces, even when the fact is not specifically stated; but I hasten to point out that, even if one is used when the other is meant, the difference of 49 grains in 480 (a difference of less than 10 per cent) will not matter in the slightest in the case of those chemicals which are weighed by the ounce, half- or quarter-ounce. It is to be hoped that the words pint and quart will drop out of photographic formulæ, owing to the fact that in America the pint is 16 fluid ounces, while in England it is 20 ounces; the quarts in the two countries being respectively, 32 and 40 ounces. Except for this fact, the fluid measures of the two countries are the same, namely: 60 minims = 1 dram (or drachm); 8 drams = 1 ounce.

The Metric System

There is no mystery about the metric system nor half the complication which the text-books make of it. I can give it here in a few words. The cubic centimeter (cc.) is the unit of liquid measure. It is equal to about 17 minims of common measure. One fluid ounce is about 30 cc.'s. 1,000 cc.'s make one liter. So much for measures. No minims, fluid drams, ounces, pints, American or Eng-

lish. Now as to weight. One cc. of pure water weighs one gramme. A gramme is thus about 15 grains. An ounce by weight equals about 30 grammes (these are only approximate; we will have the exact figures directly), 1,000 grammes equal one kilogramme—usually abbreviated to "kilo," but not used so much as the expression "1,000 grammes." Kilo equals about 2¼ pounds.

Subdivisions of cc. and Gramme

The prefixes, deci-(tenth), centi-(hundredth), and milli-(thousandth) are joined to the word gramme, but it is far more usual to write these subdivisions thus: .1, .01, .001; and to speak of them as "point one," etc. There are no special appellations for the subdivisions of the cc. These are written .5 cc., .01 cc., etc ("half a cc.," "point nought one" or one-hundredth of a cc., etc.). Here you have, then, everything which replaces the many variants of the weights and measures in usage in America and England, the gramme, the cc.—with the liter and the kilo as addenda.

Metric Measures in Practice

A box of metric weights from 500 grammes down to .1 gramme supplies our wants as regards weighing. For measures, a ten cc. measure (graduated into tenths) replaces the dram or minim graduate. The others of various sizes can be obtained from almost any dealer in druggists' supplies, of the same shape as those now in use, and, indeed, measures graduated in both English and metric units are obtainable.

Converting to and from Metric

It would be easy to fill a whole number of THE PHOTO-MINIATURE with tables and rules of equivalence of the metric and other weights and measures. I will prescribe a formula in a single line, namely purchase a set of weights in both systems. There is no simpler rule than that, and the cost is not great. Otherwise, the best I can do is to remind the worker that there are two ways of converting formulæ. We may convert each weight or volume into the exact metric equivalent, in which case the new formula is item for item the equivalent of the old one; or we may convert so as to obtain a formula of the same composition, but

of a different total volume. The second method is usually the better, because it allows of formulæ being obtained in round numbers in both cases. Example. (Hydroquinone single solution developer.)

	I	II	III
Hydroquinone . .	100 grains	6.48 gms.	11.4 gms.
Sodium sulphite .	1½ ounces	42.5 gms.	75.0 gms.
Sodium carbonate.	3 ounces	85.05 gms.	150.0 gms.
Water	20 ounces	568. cc.'s.	1,000 cc.'s.

It is rather complicated in any case, but the reader can see that by converting direct from grains or ounces per 20 ounces into grammes per 1,000 cc.'s (formula III) we get the round figures which are more easily comparable.

Weighing "Near Enough"

There is such a thing as needless accuracy in weighing. For one thing, it is no good to weigh more accurately than solutions can be measured, and probably a careful worker in the darkroom will not measure out stock-developing solution to within 5 per cent; that is to say, when measuring 20 ounces of developer he may easily be half an ounce over or under, and he will not expect any appreciable difference from the error. Then again, few substances exert a very strong effect in small quantities, e.g., in weighing out sulphite for a developer an extra quarter-ounce in 4 ounces would not make an appreciable difference, and therefore it is needless to weigh it within half a grain. To give a general rule which will not lead the worker astray, your weighings will be quite accurate enough if they are within 5 per cent of the quantity required. This means that in weighing 20 grains you must be correct to a grain, and in weighing 20 ounces correct to an ounce,—in short, correct to one-twentieth of the total amount. Let not the reader jump to the conclusion that he should make an invariable practice of weighing chemicals in the free way indicated by these figures. That is not the object of giving them. My aim is to make clear that the final minute adjustment of the weight—the part of the operation which consumes the greater portion of the time—is really unnecessary. In

most cases we can be more accurate than the five per cent limit of error, and still weigh out with convenient rapidity. A few experiments with the smaller weights will show the amount of swing of the scale corresponding to a given small excess or deficiency of the substance being weighed out.

Powdering

A wedgewood pestle and mortar is the best thing for powdering chemicals. In purchasing one, see that you get a pestle with a fairly flat end. A too-rounded end is less efficient for the purposes of the photographer, who does not want exceptional fineness, and is apt to throw the crystals out when used with sudden vigor. Make a point of cleaning the mortar directly after use.

Fig. 1.
Pestle and Mortar

Fig. 2.
Undesirable Pestle.

Fig. 3
Desirable Pestle.

In the absence of a mortar, a piece of stout brown paper and a wooden roller or mallet does the work almost as well.

Of the chemicals commonly used, the following are better reduced to rough powder before dissolving: sodium sulphite, alum, borax, mercuric chloride, potass ferricyanide, potass oxalate, potass bichromate, potass metabisulphite.

Weighing Out

Every darkroom ought to have two balances—one for weighing small quantities up to, say, a quarter of an ounce, and another from this latter quantity up to a pound or so. The first is for chemicals required in small amounts, but with approximate exactness; the second for substances such as hypo or potassium oxalate, which are weighed out in larger quantities. For the former, the ordinary beam balance of the dealers, preferably with

glass pans, is the best; for the latter, a spring balance with a good-sized pan six inches or more in diameter and detachable from its setting. To those who care to go to the expense, the most convenient plan of any is to combine these two scales in one and to use a Beranger balance (Fig. 4). An instrument of this pattern carrying two pounds is delicate enough for the smaller quantities a photographer requires, but it is expensive.

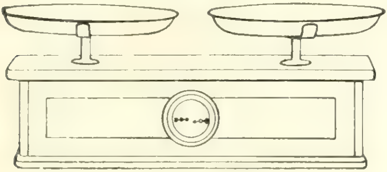

Fig. 4.

When very small quantities of chemicals have to be weighed out, it is best to make, instead, a stock solution (10 per cent or 1 per cent), and to measure of this the quantity required to give the weight of salt. Thus, instead of weighing 2 grains of sodium sulphite (for a toning bath) I would dissolve 44 grains in 10 ounces of water (i. e., make a 1 per cent solution) and use 200 minims.

It is of the utmost importance to keep the pans of the balance scrupulously clean. That is why glass is best; practically no chemical attacks it. But there is no need to place the salt on the bare pan. In fact, this should never be done. Cut out circular discs of paper and keep a stock handy, placing one on each pan. Or a better way is to get a little aluminum bowl or dish which will stand on the pan and to cut a counterpoise for it out of sheet lead. It is quite easy to clean a separate vessel, but not so in the case of the pans.

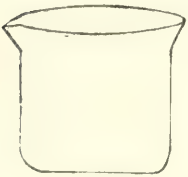

Fig. 5

When liquids have to be weighed, a glass vessel must be counterpoised. The best for the purpose is the beaker (of the analytical chemist) of the low and wide type (see Fig. 5). It is very light, stands steadily on the pan and pours cleanly; but it must be most carefully handled, for it is very thin and broken at once if squeezed or set down hurriedly on a hard place.

Water

Whether tap or distilled water is to be used is a point about which writers in photographic subjects are pleasantly at variance, many prescribing distilled water for purposes for which others regard ordinary tap water as quite sufficiently pure. The local varieties of water account for this, some towns being supplied with water which is practically as pure (i. e., as free from dissolved mineral salts) as distilled water. In other towns, the "hard" water contains a considerable quantity of lime or magnesium salts, which make themselves evident when caustic potash or soda, potass oxalate, lead nitrate or other salts are dissolved in the water. However, I think we may agree upon a standard rule in this case also, viz., to use distilled water for all solutions containing gold or platinum salts, and for all others to use tap water which has been briskly boiled for 5 minutes in a clean vessel, preferably one of enameled iron, but a clean tinned sauce-pan or kettle is quite admissible. By this boiling, the greater part of the mineral salts are precipitated whilst the dissolved air is expelled. The water is left to cool *quietly*, so that it is not caused to take up air again, this latter being a chief factor in the preservation of developer solutions. If any chemicals dissolve in this boiled water, with the formation of a milkiness or turbidity, the remedy is to let the solution stand for a while and pour off into another bottle when it has cleared, or pass through a filter. Silver solutions have not been included in this general advice, since they are so seldom used except in the photographic factory. In their case, the cause of a milky solution is the salt ($NaCl$) found in most waters. Distilled water is usually used, but the amateur will find he can get on just as well without it for any purpose for which silver nitrate is used, by using ordinary water, vigorously shaking the solution and passing the liquid through a good filter paper, which will retain the precipitated silver chloride.

Dissolving Chemicals

In addition to powdering, the rapid solution of chemicals may be helped by two other means: (1) using warm or hot water and (2) arranging to place the substance at the top of the water in which it is to dissolve, so that the

heavy solution sinks as it is formed. This latter is not of any practical use except when dissolving fairly large quantities, say a pound or so. A small alcohol stove or lamp such as will boil a pint of water in five or six minutes is about the readiest means of securing a supply of hot water where the facilities of the kitchen are not available. A small kettle may be used to hold the water or, better, one or two "beaker-flasks," which can be purchased from dealers in druggists' supplies, and allow of the chemicals being quickly placed in them whilst there is no difficulty in getting at every part to clean them. The chemicals which dissolve a good deal more quickly when hot water is used are:—Soda sulphite, mercuric chloride, potass oxalate, oxalic acid, alum, hydroquinone, potass ferricyanide, borax, lead nitrate, and potass bichromate. Hypo should be added to this list, not because its solubility in cold water is so slight as to render hot water advisable, but because it chills water in which it is dissolved to such an extent that the dissolving process is retarded and the solution, in any event, has to be warmed before it can be used.

Chemicals which dissolve very quickly in cold water are:—Ammonium sulphocyanide, ammonium bromide, citric acid, potassium bromide, potassium carbonate, potassium cyanide, potassium hydroxide (caustic potash), sodium acetate, sodium carbonate, sodium hydroxide (caustic soda), sodium chloride (common salt), uranium nitrate. For these it is of no advantage to use hot water.

I must add that some salts *must not* be dissolved in hot water if they are to be obtained unaltered in the solution. The chief of these are: Potassium metabisulphite, sodium bicarbonate, sodium sulphantimonate (Schlippe's salt).

In aiding solution by placing the salt at the top of the liquid, the readiest method is to tie the crystals up in a bag of canvas or muslin, suspending this latter in the mouth of the jug or jar to contain the solution. To still further facilitate the making of the solution, pour hot or warm water from a kettle through the bag until the latter is covered. Very little time need then elapse before the whole will have passed into solution. This method is chiefly of service when making stock solutions.

Order of Solution

In the case of developers, it is well to make it a rule to dissolve all the other constituents before adding the developing substance itself, or at any rate the sulphite should be dissolved before the developer, otherwise the solution suffers a certain amount of oxidation, which is obviated by having the sulphite present at the first. In the case of other solutions, the best order of solution depends on special circumstances; but it may be taken as a general rule that, whenever any substance is employed to keep another in solution, the solvent should be the first to be dissolved. It is a matter of common experience in chemistry that it is easier to keep a substance in solution than to re-dissolve it when once it has been precipitated. A case in point is the copper-toning solution, in which potass citrate is used to keep in solution the copper ferricyanide formed from potass ferricyanide and copper sulphate. The order of making up the solution should be citrate—ferricyanide—copper.

When to Filter

Whenever possible, it is best to allow a solution to clear of itself by deposition, pouring off from the sediment into a fresh bottle; but, if this cannot be done, a circular filter-paper folded into a cone and held in a glass funnel will serve to remove the suspended impurities. In no case should developer containing pyro or hydroquinone and other readily oxidizable developer be filtered, as the process exposes the liquid drop by drop to the air and promotes oxidation. If filtration has to be done, it should be performed before the pyro is added.

Storage in Small Bottles

A similar principle will guide the worker in keeping a stock solution of developer. If a number of small bottles, three- or four-ounce capacity be used in place of one large one for the storage of the solution (each being filled quite to the stopper), the constant admission of air from opening the bottle will be avoided, and developer solution kept in this way may be preserved good for a much longer period.

With this brief summary of the chemicals most commonly used in photographic processes, the reader is equipped for fully 90 per cent of the work he is

likely to attempt. In the case of special processes, where more or less complicated chemical changes are involved, as in the toning of bromide prints, an outline of the chemistry of the methods under discussion is usually given in the text books devoted to the process, e.g. the works on *Toning Bromides* by Smith and Somerville.

BOOKS

Photographic Chemicals. By W. Taylor. A series of papers republished from an English journal, telling how the various chemicals used in photography may be prepared by the photographer himself with the aid of simple apparatus. Illustrated. 107 pages. 50 cents.

The Elementary Chemistry of Photographic Chemicals. By C. Sordes Ellis. In this work the chemical agents discussed are treated in groups according to their use in photography. No less than eight appendices are given after the text, offering much useful information. 120 pages. 50 cents.

Chemistry for Photographers. By Chas. F. Townsend. This is undoubtedly the most useful handbook on its subject at present available, giving the chemistry of photographic practice in convenient and readable form, with typical formulæ, tables, etc. Fourth edition, revised. 130 pages. 50 cents.

Notes and Comment

The photographic event of the month is a double event, i. e., the exhibitions of the Linked Ring (Salon) and the Royal Photographic Society, now open in London. For an adequate review of these, with illustrations, we in America must await "Photograms of the Year," which will be ready in a few weeks; but the following impressions, gathered from our exchanges, may be of interest.

The R. P. S. exhibition is generally spoken of as the best of the fifty-four thus far held by the Society, which is no mean praise. It comprises separate sections devoted to Pictorial Photography, Scientific and Technical Photography, Lantern Slides and Transparencies, Autochrome and Color Work, Professional Photography and Photographic Apparatus and Material—over a thousand exhibits, fairly representing the progress of photography in all branches during the year.

According to the catalogue, there are at least 15 American prints in the Pictorial Section, which comprises 214 prints in all. The American exhibitors are Louis Fleckenstein, R. S. Kauffman, H. W. Minns, Dwight A. Davis, R. T. Dooner, John Chislett and Carle Semon. A noticeable feature is the absence of small prints; another, the large proportion of prints by the oil and bromoil processes. Of the 214 prints in the Pictorial Section, 125 are made up as follows: Oil and bromoil processes, 40; bromide prints, 34; platinum prints, 24; carbon and ozobrome, 14; gum prints, 10; other processes, silver, gaslight, etc., 3. Many of the gum and oil prints "attempt color," but, according to one of the critics, simply serve to show the limitations of these methods.

The Technical Section is said to be unusually strong, especially in nature photography. Astronomical, spec-

trum and x-ray photography are well represented. In the Color Section autochromes predominate, three-color carbons having disappeared, Pinatype being represented by only five examples, and a single print by the Sanger-Shepherd method, which attracted so much attention a few years ago. Among the autochromes, special interest attaches to a snap-shot of an express train, exposure $\frac{1}{25}$ second, with a Grun lens at f 2.5. The definition is said to be remarkable. Other autochromes show wild animals in captivity, which must have involved short exposures.

In the Process Section, much interest centers about the exhibit of the Paynetype Direct Photo-engraving Method, which shows the process in its various stages. We learn that this simplified method of producing line and halftone plates direct in the camera will shortly be available in America.

The Salon of the Linked Ring is this year marked by innovations; first, the disappearance of the usual American pictorial contingent, concerning which "Photography" says: "With it has gone much that is eccentric, and—we are compelled to admit it—much that has hitherto made the Salon attractive." Which looks as if the withdrawal of the Photo Secession had resulted in a dull and lifeless show! The second innovation is the display of a fine collection of portraits made by D. O. Hill in 1845, concerning which "Photography" says: "They make the modern work look thin and feeble," and the "British Journal" says: "It is not salutary that Hill should be regarded as an abnormally shining light in artistic photography;" and F. H. Evans says; "It is a staggering display, reducing our current work in portraiture to a very poor place in comparison." After all this, to set the moderns in place, it is decidedly encouraging to read that "The delicate vitality of Mrs. Kasebier's work alone stands comparison (with D. O. Hill's work) unharmed . . . Her three exhibits deserve the most patient study; superb vision coupled with perfect accomplishment."

Apart from these novelties, the Salon of 1909 is pronounced to be a very interesting and satisfactory show. America is represented by ten exhibits, out of a total of

140 prints. As far as we can make out, these ten exhibits were sent by Mrs. Kasebier, Francis J. Bruguiere, W. H. Porterfield, A. Thibaudeau and H. Mortimer Lamb. The pictures of Mrs. Minna Keene (South Africa), J. Dudley Johnston, Craig Annan, E. O. Hoppe, and Furley Lewis, are singled out as worthy of praise.

The sensation of the Photographic Convention held at Rochester a few weeks ago was the Seneca Hingeless Adapter for Filmpacks. Those who, like ourselves, have learned to appreciate the Filmpack as one of the most desirable of photographic conveniences, should not miss seeing the Seneca Adapter. It is simplicity itself in loading and manipulation, has a specially devised light-trap which makes fogging of the film impossible, no matter at what angle the slide is introduced, and is without the slidehead or handle, which is apt to crack or break by its projection. A booklet describing the new Adapter can be had on request from the Seneca Camera Mfg. Co., Rochester, N. Y.

The "Defender Tipster" (Defender Photo Supply Co., Rochester, N. Y.) has reached its fifth edition and is more interesting than ever. The new edition contains many new and corrected formulæ, including a single method of obtaining sepia tones in a single development on Special Portrait Argo. No reader of THE PHOTO-MINIATURE should attempt gaslight printing without "The Tipster" at hand. A post-card to the publishers will bring a copy by return mail.

The frequency of complaints about thin, unprintable negatives, and the many demands for a "really reliable" formula for intensification, indicate that the "really reliable" "Chromium Intensifier Tabloids" made by Burroughs, Wellcome & Co. (New York and London), are not so widely appreciated as they should be. With this intensifier, the process of strengthening a weak

negative is simplicity itself, and the use of mercury or other poisonous salts is entirely obviated. A single Chromium Intensifier Tabloid is dissolved in two ounces of water. In this solution the weak negative is immersed and gently rocked until bleached. After washing, the image is re-developed with amidol or any similar, non-staining developer. If the density desired is not obtained by this procedure, the process can be repeated without fear of stain or injury to the film.

Those who have to deal with the difficult problems involved in photographing colored objects for reproduction or other industrial purposes will find much instructive information in a pamphlet just published by Wratten & Wainwright, Ltd., Croydon, England (price 15 cents), entitled, "Wratten Light Filters," which lists and describes the color-sensitive plates and filters introduced by this firm. The list covers several pages, giving the trade names, the purpose for which to be used, their light stability and the multiplying factors of the filters and is accompanied by an atlas giving the absorption spectra of some 70 filters of various kinds.

Number 7 of "The Telephoto Quarterly" is now ready. Apart from its informing papers on "The Telolens in Architecture," "Orthochromatic Telephotography," "A Telecamera Without a Teletube," and other subjects, this number offers a series of telephoto illustrations which are eye-openers in every sense. Subscription, 75 cents per year: Tennant and Ward, New York.

A remarkable plate now available for American workers is the new Barnet Super-Speed Ortho Plate, with the actual speed of 400 H & D. (J. L. Lewis, 379 Sixth Avenue, New York). According to its manufacturers, this is the quickest plate made, and has double the usual orthochromatic efficiency. Full particulars can be had from the American agent, addressed

as above. When writing, readers should also ask for the new Barnet Booklets, 3 and 4, "The Simple Art of Picture Making" and "Barnet Ortho Plates," from which many useful hints and facts can be gained. The firm of J. L. Lewis, by the way, probably carries a larger variety of photographic papers than any other American house in the trade, his list comprising no less than 25 distinct kinds of paper, in over 100 grades.

Within the next few weeks the new Annuals will be ready for delivery and, according to all accounts, the picture lover and omnivorous reader will have a veritable feast of good things. First in interest and pictorial attractiveness comes "The American Annual of Photography, 1910" (George Murphy, Inc., New York), in the making of which some three hundred enthusiasts have busied themselves. Having a personal knowledge of the contents of this Annual, we can venture the opinion that it will be a splendid volume, both as to the quality of its information and in its illustrations, and a book which no intelligent worker in photography should overlook (November 25). "Photograms of the Year 1909" is promised for delivery early in November. As in past years, it will give detailed reviews of the great exhibitions of the year, and of the progress of pictorial photography all over the world. The illustrations, better in quality and much better in reproduction, will number two hundred examples, selected from the best work of the year. (Tennant and Ward, New York.)

"The British Journal of Photography Almanac 1910," as bulky as ever and as interesting as ever, will be ready in December (George Murphy, Inc., New York); as also will "Penrose Process Year Book 1909-10," the well-known process workers' annual, edited by W. Gamble. (Tennant and Ward, New York.)

"The Photographic Annual, 1909," briefly noticed in our last issue, has proved a big success. Thousands of copies have gone out since its publication, the first large shipment being exhausted within four weeks. A new shipment is now ready for delivery and those who need a copy of this useful reference book of "Figures, Facts and Formulæ of Photography" should not delay their order, lest they be disappointed.

A cleverly written booklet on "The Photography of Color Contrasts," quite out of the ordinary line of trade literature, comes to us from the Research Laboratory of the Cramer Dry Plate Co., of St. Louis, Mo. It embodies a great deal of patient work by R. James Wallace, and gives much direct practical help in the copying of colored objects or prints. Copies may be had, on request, from the Cramer Dry Plate Co., so long as the edition lasts.

According to an article in "Bench and Bar," wherein several decisions of New York State courts are quoted, the recent legislation forbidding the publication or use of portraits without the consent of the persons involved is declared constitutional. The statute in question is contained in section 2, chapter 132 of the laws of 1903. It gives to a person whose name or portrait is used for advertising purposes or purposes of trade a right of action for injunction or damages, unless such use has been authorized in writing. From the decisions quoted in the article, it is apparent that the statute applies to the use or publication of portraits for advertising or trade purposes, or as special features in books or magazines, and not to the publication of portraits as part of or in connection with news in a newspaper.

Our attention has been called by a subscriber to certain points in telephotographic calculations which are not made quite clear in the monograph on that subject in THE PHOTO-MINIATURE No. 90. The subjoined explanations refer to the rules on pages 254, 255, of that number.

On page 241, the writer states that the degree of magnification is to be understood as "linear," and then, to make it clear, says that a square inch magnified four times "is increased in size to four square inches." Obviously, if one square inch is enlarged four times in its linear dimensions, the enlarged image will be four inches square, i.e., sixteen square inches.

(2) On page 255, direction for finding the exposure

is to multiply the exposure required with the positive lens alone by magnification of the image on the ground glass. This should be corrected to read "by the square of m," in accordance with the rules on page 257 under exposure.

(3) In speaking of the length of bellows required to give a desired magnification, on page 255, the words "the distance from the negative lens to the screen" should be inserted after the word "bellows." The explanation is that the extension of the bellows must be sufficient to allow for the requisite distance between negative lens and fixing screen required by the magnification.

The Dresden Exhibition

The following notes concerning the International Photographic Exhibition held at Dresden this summer are gathered from a series of illustrated papers which appeared in the "British Journal of Photography." Judging by this account the Exhibition was at once the most comprehensive and interesting showing of photography, its apparatus, products, processes and applications ever gathered together. The catalogue, a substantial volume of 350 pages, shows that the exhibition was particularly strong in scientific or technical photography, professional portraiture and amateur or pictorial work. The collection of American professional work was fairly representative of its class, including all the familiar names, such as Pirie MacDonald, Julius Strauss, J. B. Falk, H. H. Pierce, Elias Goldensky, Gertrude Kasebier, E. B. Core, Dudley Hoyt, George Edmondson, J. H. Garo, *et. al.* From the list of American amateurs exhibiting, we may mention Frank Roy Fraprie, Wilfred A. French, Howard D. Beach, W. E. Bertling, Katherine Bingham, D. H. Brookins, Mrs. W. W. Pearce, J. W. Nicholson, J. R. Peterson, W. H. Porterfield, Gustav Eisen and Theo. Eitel. In pictorial photography the British section was said to hold the first place although we have as yet no information as to the exhibit

of the Photo-Secession. The scientific and trade sections of the Exhibition were naturally German and Austrian, comparatively few French, British or American firms being directly represented.

Dresden, as most of our readers are aware, is the principal center of the photographic industry in Germany, with a population of about 500,000 people. The Exhibition buildings are admirably suited for their purpose, the main building being a large stone edifice with a frontage of several hundred feet. They are located in a summer resort or park about a mile from the center of the city, whither the citizens are accustomed to go to listen to good music or drink "good Saxon beer" at an outdoor restaurant of immense proportions such as one finds in many continental cities.

In a rapid tour of the exhibition the first impression was the large representation of the German photographic trade, hardly a single German house of importance being unrepresented. This section included about 200 stalls, some of them elaborately designed for display and demonstration.

The comprehensiveness of the sections devoted to the scientific applications of photography next claimed attention. These sections were subdivided as follows: Teaching and Instruction; Research and Experiment; Botany; Zoölogy and Anthropology; Detection of Crime; Bibliographical Photography; Physics and Chemistry; Pathology; Meteorology; Astronomy; Color Photography; Press Photography; Mineralogy and Geology; History of Photography; Photogrammetry; Balloon Photography; Military Photography. Noting that no less than three large rooms were devoted to the sub-section of Detection of Crime and Municipal Legislation, this classified list will give the reader a fair idea of the thoroughness of the Exhibition as a whole.

As example of the extreme interest attaching to the sections when these were carefully examined, we may quote from a description of the Section of Botanical Photography. Here J. Ostermaier, of Dresden, showed a large series of plants of Central Europe, the photographs in every instance showing the subject in its natural surroundings. The series included a set of

Alpine plants growing above the snow-line. In every instance there was mounted with the monochrome photograph a color print of the subject in the shape of a multi-color lithograph for comparison. Alongside this exhibit, which was a model of its kind, was shown a collection of photographs of American plants and trees sent by J. Horace McFarland, of Harrisburg, Pa. This exhibit was notable for its splendid technical quality, and in the tasteful mounting and lettering of the individual pictures showed more care and skill than most of the other technical exhibits.

A series of twenty galleries accommodated the display of professional work. Germany was represented by 65 exhibitors; Switzerland, 29; Holland, 21; U. S. A., 40; Sweden, 7; France, 3; Italy, 2; Finland, 6; Denmark, 4, and Norway, 1. The British professional exhibits were included with the amateur entries from Great Britain, embracing perhaps twenty per cent of that section.

An idea of the magnitude of the exhibition may be had from a remark dropped by an American visitor who spent four days in the scientific and trade section and came away saying that he had not seen one-half of the exhibits.

A Medieval Doorway, Rothenburg
George E. Brown

Illustrating the normal mounting of a print. Side spaces equal in width; top space slightly less that at the sides, and space below print exceeds that at top and sides.

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Trimming, Mounting and Framing

There is no need in these days to say anything as to the necessity or the importance of the three operations which supply the title of this monograph. It was not quite the same when THE PHOTO-MINIATURE NO. 20, bearing this title, appeared. In the nine years which have passed since that time, enough has been said and written on these last scenes in the making of a photograph to fill a whole volume of the "P.-M.," and the rules which should guide the photographer have been drummed into him by a score of writers not always in complete accordance with one another. At the present time, therefore, it is more essential to deal with the practical ways and means, and with the principles which should guide their employment, than to belabor the question of their necessity. I suppose the widespread popularity of enlarging has led the amateur workers to cultivate the habit of looking for the best part of a negative, and then further subjecting the enlargement to criticism before finally mounting it. At any rate, the error of thinking that the print must include the full subject of the negative is one into which none but the veriest tyro is likely to fall, so that it is a work of supererogation to utter lengthy caution as to the inadvisability of adhering in our prints to the stock sizes of our plates and cameras. True, one should endeavor to get the negative as close as possible to what is desired in the final print; but if

the secrets of all hearts could be read, one would probably find that the faith of most of those who achieve success in pictorial photography would be expressed in the words of a well-known worker to the present writer, viz., that "it is a poor negative that hasn't got a good inch somewhere in it." Let not the gentle reader suppose, however, that this monograph is written solely for the benefit of those whose aim is pictorial. The unnumbered thousands whose work is less ambitious, though no less meritorious, will, it is hoped, learn how to carry out the work of trimming, mounting and framing their prints with speed, neatness and certainty; and these are points in the making of a print, in which, so far as the present writer's observation goes, assistance is often sorely needed.

Pictures Within Prints

Nevertheless, as the very mention of trimming implies that there is something to be cut away, it should be said at the start that the first piece of stock-in-trade of the worker would be a couple of good-sized L-shaped pieces of card, which can be moved together over the print, in order to discover by a process of exclusion which is the essential part of the subject. Fig. 1 shows the form of these cards, which may be roughly cut from any piece of millboard and kept handy for use. One British firm has issued a pair of cards of this shape attached to each other in such a way that, however one card is moved in relation to the other, a strictly rectangular shape of opening is retained. Usually, however, our selection of the whole subject of the negative is provisional at this stage, and such a truly rectangular opening of our pair of cards is really of little use. The main thing is that we do employ a method such as this to make the best selection of the material in the complete print, and that we apply it, when trimming the print or when masking a negative prior to enlargement.

Geometry of Trimming

It is necessary to make sure that the method adopted for trimming a print, or for marking it preparatory to trimming, is actually capable of ensuring true right-angles at the corners. The professional worker who trims his prints all to a few stock sizes gets over this part of the process

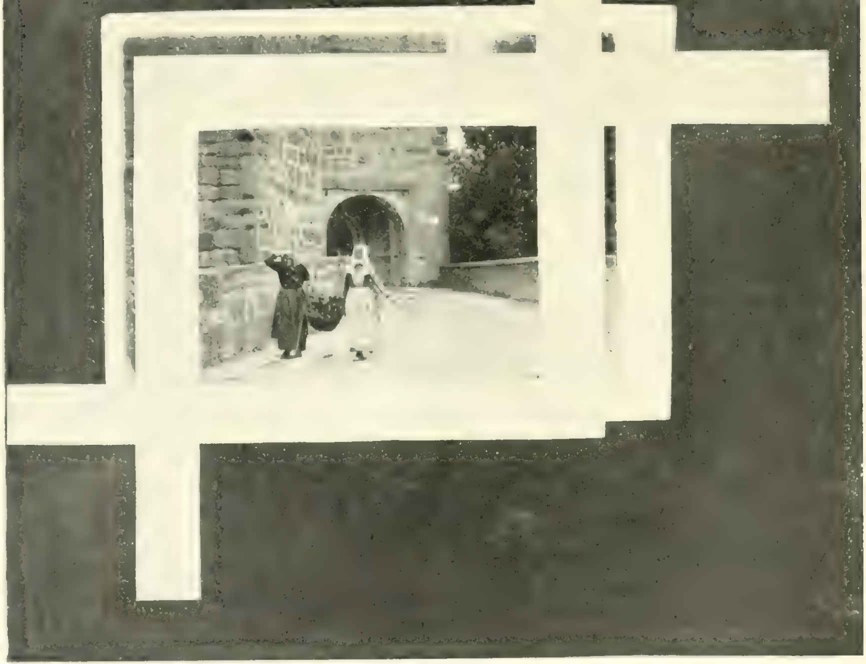


FIG. 1. Illustrating the use of L-shaped pieces of card

without much trouble, because he uses a series of glass templates or cutting shapes, which he lays upon the prints, runs a knife around, and the trick is satisfactorily done—that is, if the cutting shape is truly rectangular, which it often is not, when purchased. In German studios, it is a common plan to lay the wet print, as it comes from the wash-water, on the cutting shape, and trim off the projecting portions with a sharp pair of scisssors. But, for our purposes, these methods are the last we should adopt, since they restrict us to a few standard sizes, and lead one to make do with what is nearest the size and shape of the cutting glass. We require a method by which we can mark off or trim off at any point, and be certain that the print will be truly rectangular. Exact "squareness," it should be added, is a matter of the most vital importance when multiple mounting, as described in the latter portion of this monograph, is to be done. But first, a word on the basis from which we must start in trimming the print.

Correcting Faults in Prints It may often happen that, owing to the tripod not having been level at the time of the exposure, the horizon in the negative is not truly horizontal; or, what follows from the same cause, the vertical lines are not truly vertical. This defect is easily and absolutely remedied by first trimming one side of the print with a straight edge, which is laid on parallel with the line which should be (and in the print, will be) perfectly horizontal or vertical, as the case may be. But, if the departure of the lines in the negative be due to tilt of the lens axis, the remedy by trimming can be only a compromise, and usually not a very satisfactory one. The lines, in this case, which should be vertical, converge in the upper part of the print (upward tilt of the lens at the time of the exposure), and no trimming will make good. The best course, if a print of this kind must be mounted, is to distribute the defect as much as possible. Lay the straight edge at such an angle with one of the "drunken" lines that about half the error is masked; unless, of course, there is but one line of a building thus defective in the subject, when, in most cases, the other parts of the subject may be left to take their chances, and the

trimming employed to correct the only departure from truth which will be strongly in evidence.

Trimming Methods

Let us assume, then, that one side of the print has been marked or trimmed by means of a perfectly straight rule. The problem is to mark or trim the other three sides so that all the angles are right-angles. The common method of doing this is by means of a triangular set-square, which is set against the edge of the print already trimmed, and cut number two made. In like manner, one side of the set-square is again set against one or the other of the edges, trimmed, cut number three made; and so, again, for the last edge. The trouble with this method is that the eye cannot readily see when the triangular set-square is placed square to the clean edge. It is really necessary to have a stop against which both may be pushed, and then it is not easy to make a clean cut right to the corner. In practice, by this method it is very easy to trim a print very considerably out of square, owing to slight error in placing the set-square. To be certain of really accurate trimming, it is necessary to have a glass trimming shape ruled with parallel lines about one-eighth of an inch apart, and with at least one corner (marked) a true right-angle. Though there are some ruled shapes on the market, in England, there is none apparently of the above sufficient fineness of ruling, and, moreover, the commercial glass shape is not infrequently a little out of square. I therefore recommend the worker to get a piece of ground-glass accurately cut to a given size, say 15x12 inches, and have two edges ground smooth to a perfectly true right-angle. The ground side of the glass is then ruled with hard pencil with lines one-eighth inch apart, using a T-square and set-square for the purpose. The ruled surface is then given a coating of celluloid varnish, and is ready for use. The lines in the middle parts of the glass allow of the glass being placed true with the lines in the subject. Then, the exact position of the trimming-shape having been selected, so far as concerns the two sides enclosing the true right-angle, the first two cuts are given to the print. The shape is then turned around, so that the marked corner comes diagonally opposite its former position.

Care is given that the ruled lines on the shape are parallel to the edges which have already been trimmed, and the second pair of cuts again made either side of the true right-angle. Used in this way, the trimming-shape will allow of prints being trimmed with perfect accuracy and fairly quickly.

Drawing Board, T- and Set-Square By far the most certain and accurate method of trimming, and the best for prints of large size, is first to mark off with a pencil a little outside of the actual dimensions required, and then, with a straight edge as a guide for the trimming-knife, cut off a shade inside these lines. The print is laid on the drawing-board, the T-square (shoved square with the board) laid over it, and the print shifted until the edge of the T-square falls along the line of the subject which is to serve as the base from which the print is to be trimmed. The print is then pinned down, and the T-square and set-squares used to mark off the portions required. In thus trimming, by aid of a metal straight edge, the latter can be placed very accurately just inside the penciled lines, since nothing is easier for the eye to judge than the parallelism of two lines which are close together. A well-sharpened HHHH pencil is used to mark off, and the slightest variation in the space between the straight edge and this thin line is at once seen. The method may not be as rapid as the use of the guillotine trimmer now to be described, but is second to no method in accuracy.

Guillotine Trimmers A great variety of trimming boards fitted with a guillotine knife are on the market. None of them give the same facility of squaring up the print with the lines of the subject which is afforded by the two previous methods; but for straightforward work they are all a good deal quicker than the use of a shape and a knife. In all, a cut is given to start with as seems best for the print, and then this clean edge is turned against a stop fixed at right-angle to the knife and a second cut given, and so on, until all four sides have been trimmed. With all but very thin prints, such as those on thin albumen paper, the boards give very good squareness of print. Perhaps the best pattern of all is that known as the "Merrett,"

in which the board is hinged, and the cutting-blade made to press against a metal-faced edge; the hand which holds the print against the stop is thus available also, for making the cut by pressure on the board. The cut given by this trimmer is very true and even, and the

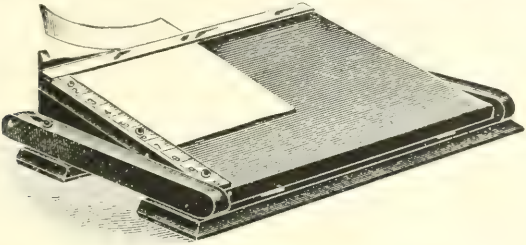


FIG. 2

apparatus is of great service for multiple-mount cutting, but it cannot be used to cut up thick boards, as can the heavier-made guillotine cutters of equal size. It is shown in Fig. 2. [This trimmer has just been placed on the American market by the Eastman Kodak Co.—EDITOR.]

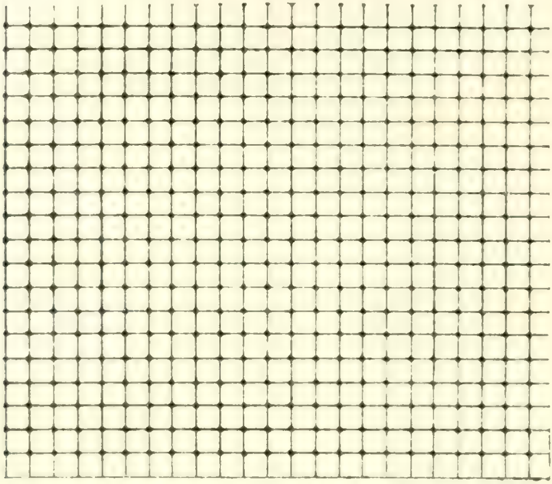
Maitland Trimming Gauge

Before leaving the question of devices for ensuring correct trimming, mention should be made of a very ingenious plan, the invention of Viscount Maitland. It consists of a piece of celluloid or engineers' tracing cloth ruled with two series of parallel lines into a series of small squares (about one-fourth inch). It is laid on the print to be trimmed and moved about until the portion desired in the trimmed print is arranged within a certain one of the innumerable rectangles formed by the crossing lines. A fine perforation is then made with a needle through each corner of the rectangle, the print removed, and a straight-edge trimmer used to cut it down from point to point of these four holes. This is most conveniently done with the print laid face down. A section of this Maitland Trimming Gauge is shown on following page.

Trimming Knives

Many workers prefer to use one of the many wheel-trimmers sold at prices from thirty-five to seventy-five cents. The advantage of this type of cutter is that it remains in working

condition for a much longer time than a knife. It is made in two patterns, in one of which the wheel is mounted so that it can rotate, whilst in the other it cannot. The latter is all that is required for making straight cuts: the former is needed when trimming oval prints to oval or circular shape. The writer is perhaps prejudiced by long habit, but he certainly prefers a knife to the wheel-trimmer on account of a cleaner cut, even though a



Section of Maitland's Trimming Gauge

knife cannot be used as a wheel-cutter can for trimming wet prints. A very strong and cheap knife, sold as a cobbler's or bootmaker's knife at a cost of from 6d. to 1s (12 to 25 cents), of the form shown in Fig. 3 is a most useful trimming tool. Only the end part is sharpened, and the broad strong blade of the knife gives a very firm cut. Another form of knife which is much used is the double-bladed knife shown in Fig. 4, the short, stubby form giving great strength. The form shown in Fig. 3, however, will meet all practical requirements. It can be obtained at any hardware store.

Trimming Block

The board on which the print is laid to be trimmed requires to be hard, otherwise it is soon cut up by the knife; and it also requires to be soft, otherwise the knife is blunted before being very long in use. About the best compromise between these irreconcilable requirements

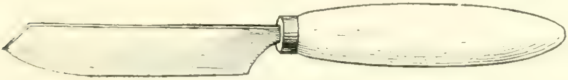


FIG. 3

is a piece of flat zinc, which is usually screwed to a stout board, It is preferable to glass in that the surface grips the print more firmly. Another good material for a trimming-block is brown millboard, sometimes called bookbinders' board; but it has to be frequently renewed, every stroke of the knife working its destruction.

We are now in a position to pass to the mounting of our trimmed print. Trimming methods have here been dealt with at what may appear undue length; but the subject is one which most writers of text-books dis-

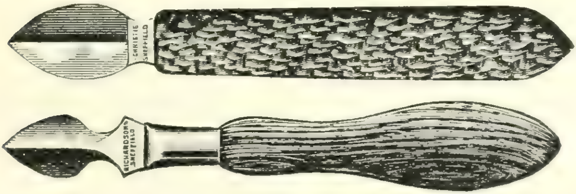


FIG. 4

miss in a few words, under the comfortable assumption that the operation presents no difficulties to the beginner, whereas, unless the present writer is mistaken, it is the one part of the photographic process which the beginner most prefers to shun, as witness the universal popularity of the slip-in mount and similar evasions. We will now pass to the most practical methods of mounting small prints in numbers, large prints a few at a time and, finally, the use of several mounting papers

built up at the back of the print, the so-called multiple method of mounting.

Mountants I shall not give more than two formulæ for preparing mountants: The commercial ready-made mountants now on the market, of which the forerunner and still a standard article is Higgins' Photo-Mounter, possess points of superiority over the usual home-made mixtures. These modern mountants are more powerful adhesives, they penetrate the mount to a less extent (*ergo* less cockling), and they possess the further great advantage that they allow of a little sliding of the print after it has been placed in position. Moreover, they are of a high degree of chemical, or, what is more, photographic purity. Still, there is one mountant, i.e., starch, which for many purposes is such an excellent substance that the amateur worker—the professional, no less—should know how to prepare and use it. Many apparently fail in preparing a proper starch mountant, but, if the essential precautions are taken, the work of getting ready with absolute certainty a perfectly pure and permanent adhesive occupies only a few moments,—and that is a point which must not be overlooked, namely, that starch paste will not keep more than a day or so. It soon loses its sticking powers and, worse still, becomes acid. An invariable rule should be to throw away at the end of the day any not used. In making the paste, use the chemically pure starch powder, not the made-up granular form sold for laundry purposes and containing other substances, such as borax, in addition to starch. Place some of the powder (about one ounce to make twelve fluid ounces of paste) in a cup, and add water *a few drops at a time*, so as to form first a semi-moist mass and then a very stiff paste. The stiffness should be such that the stirring of the mixture with a fork makes really hard wrist work. Now pour in absolutely boiling water, stirring the while with the fork. The quantity of water should be about twelve times that of the starch, but, as it is impossible to measure the water, a mark should be made on the cup and the water poured in from the kettle or other vessel up to the mark. Stir briskly, and in ninety-nine cases out of one hundred the starch will

The Silvery Thames
George E. Brown

Illustrating the treatment of the print where it is desired to give emphasis to the foreground. The depth of space below the print is prolonged in border and mount.

The Burgomaster's Daughters
George E. Brown

Illustrating the correct placing of a tall, narrow print on mount. Note that the space at top exceeds that at each side of print.

jellify, that is become semi transparent, in which state it must be in order to develop its full adhesiveness. Should it not jellify simply on pouring in the water, the mixture must be turned into a clean enameled iron saucepan and brought to the boil, when the jellifying process will at once take place. But if the mixture of starch and water be in the form of an highly stiff paste, and if the added water be absolutely at the boil, there will be no need for separate cooking. The jellified mixture is set to cool quickly by placing the cup in a dish of cold water. When cold, a skin will be found on the surface. This is taken off, and the paste is ready for use.

Mounting Prints

Now let us suppose, what is the commonest requirement of amateur workers, viz., that a batch of prints (trimmed) is awaiting attachment to their mounts in a plain unornamented way, without the trimmings of elaborate multiple mounting, the method of which, as we shall directly explain, is quite distinct. It matters not whether the prints are gelatine, collodion or albumen; the method I will now give will allow of their being mounted firmly and quickly. Starch paste may be used, or the ready-made dextrine mountant, such as Higgins', made a little weaker with water. The brush should be a good stiff hog's-hair, say a little over an inch in width or diameter and not over-long in the hairs, say one inch. The prints are placed in a big dish of water, to become limp. Five or ten minutes is ample for this; with some gelatine papers, a longer time causes the gelatine surface to become unduly soft. The prints are then laid all face down on a clean sheet of glass, placing them one on the other in piles, each of which is made up of prints of or about one size. Stand the glass on edge for five minutes, and let as much water as will drain off. Then, with a roller squeegee, or blotting-paper, press out the moisture from each pile, and commence brushing mountant over the back surfaces, exposed one print at a time. Never mind about applying the paste to the uppermost prints only. Simply paste over everything there is to be pasted, and brush well into the prints so that the mountant penetrates the pores of the paper. The mounts being at hand, lift off a print from the top of its pile, touching it

as little as possible with the fingers. The best means of raising one corner is a silver fruit-knife, the blunt blade of which cannot damage the print. Lay lightly in position on the mount and, again, lightly go over the print with a clean, soft, gritless piece of sponge, dipped in clean water and well wrung out. No need to use pressure, simply sponge the print into contact and put the mount aside. The print will adhere just as firmly as though you used a lot of pressure. Some workers make a point of mopping the back of the print with blotting-paper before pasting up, but there is no real need for it. Nor is there occasion to use anything but the sponge in securing prints to the mount. Naturally, the thinner the paper, the more easily it is attached to the mount; but the best method of adjusting the procedure in this respect is by the use of a stiffer Higgins' or other strong mountant. For most papers of normal weight, starch paste works excellently on the above plan. Obviously, the mount must be of decent quality, not one which will not bear being wetted for a second or two. Obviously, too, the mount, unless of very heavy weight and close substance, will bend or cockle to a greater or less extent, but not to an inconvenient degree in the case of prints of moderate size. For large prints, where absolute flatness of the mount is desired, there is nothing to touch the dry-mounting process. The use of a spiritous gelatine mountant is a bad second, but we will describe it first.

Non-cockling Gelatine Mountant

Cheap sheet gelatine, or a gelatine such as Nelson's No 1, is put to soften or swell in water, in the proportion of 4 ounces of gelatine to 16 ounces of water. The mixture is liquefied by standing the containing vessel in boiling water, and methylated or Columbian spirit (5 ounces) is then added, a little at a time, stirring rapidly. Finally glycerine (1 ounce) is added. The best way of applying this mountant to the print to be mounted is to dip a large piece of ground-glass in hot water, allow the water to drain off, and then brush the hot mountant over the glass. The print is laid, face *up*, on the pasted surface, and rubbed gently and quickly into contact by laying a piece of

paper over it, then removed and laid in position on the mount, and rubbed down. The gelatine mixture will keep a considerable time, being prepared for use by standing its bottle in hot water.

Placing the Print

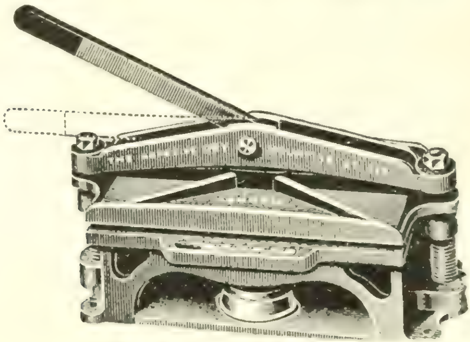
In case of a print which is a good deal smaller than its mount, it is no easy matter in the ordinary way to place the print centrally or symmetrically on the mount. Various methods of marking the mount have been recommended, but the most practical and speedy plan is to use a mask the full size of the mount and just a little larger than the print. This mask is laid on the mount so that the opening in it comes where the print is to be. It is kept in place by laying one or two weights on it, and it is then a very easy operation to apply the print centrally in the aperture of the mask, any want of centering being immediately seen from the non-parallelism of the edges of the print and of the aperture in the mask. When a number of mounts of standard sizes are used, a few masks will serve all purposes; but, in any event, the making of the mask is very quickly done with a drawing-board and T-square.

Mounting Large Prints

Though exact centering has to be considered less often in the case of large prints, which are usually mounted on any sized piece of board and trimmed down for close framing, yet, when a large print has to be placed correctly, regard must be paid to the fairly large degree of expansion which paper undergoes when wetted. This expansion takes place chiefly in one direction only, that is, in the width of the original sheet, or, in the case of paper made in roll, in the width of the roll. But the amount of expansion may be more than would be thought by those who have never measured it. A 10 x 12 print, on being wetted, will very likely expand to 10 x 12½. Therefore in trimming a print which is to be mounted wet within a certain space,—say the plate-mark of a commercial mount,—allowance must be made for this expansion, or the centering of the print may be altogether out. The print requires to be trimmed down a little smaller one way, to allow for the subsequent expansion. But this difficulty, as well as those of cock-

ling and fading of the print from the mountant or the mount, are completely avoided by the dry-mounting method invented and patented by Derepas brothers, in France, in 1901, and of late largely adopted by photographers, both professional and amateur.

What is Dry-Mounting? Briefly described, the dry-mounting process consists in the attachment of the print to the mount by a layer of shellac, which is caused to cement print and mount together by the action of heat. Shellac had previously been used as a mountant in the form of a strong solution in spirit, applied to both print and mount, and the two pressed into contact while the cement was still sticky. While this method may be used for quite small prints, it is



Dry-mounting Press

useless for those of any size, owing to the speed with which the shellac sets. Also, methods which may be called "semi-dry mounting" have been in use, notably that of Mr. Alexander Cowan, in which prints and mounts were coated with starch paste, both allowed to dry, both lightly gone over with a just moist sponge and immediately pressed into contact. These methods have not the positive usefulness and certainty of the latter-day dry-mounting system. According to the Derepas patent, which is that under which the process is marketed in the United States by the Eastman Kodak Co., the

shellac is supplied in the form of a tissue, which is cut to the size of the print and attached to the latter by the touch of a hot iron. The print with tissue at back is then laid down in position on its mount and given hot pressure in a press made for the purpose. Others have proposed to apply the shellac as a solution to the backs of the prints, and, when the solvent has evaporated, to treat in the hot press as above described; but, so far as the present writer can learn, that method is not largely used, and it is possible that it is an infringement of the Derepas patents. It will thus be seen that dry-mounting possesses three distinct advantages: 1. It avoids all distortion of the print due to expansion and contraction. 2. It avoids all cockling and bending of the mount, even of the thinnest. 3. It provides an insulating layer between the mount and the print, and thus shields the latter from any chemical effect of impurities in the mount. Of these three points, that which has had the most evident effect is No. 2, the whole manufacture of mounts, particularly those used by professional photographers, having been changed from thick heavy boards to the thin and beautiful mounting papers now so universally used in folders and portfolio mounts.

Dry-Mounting in Practice

The outfit for dry-mounting includes a supply of the shellac tissue in pieces a little larger than the prints which are to be mounted, a fixing-iron mounted in a wooden handle, and, last, a hot press. For professional work where large-sized prints have to be mounted, the cost of such a press runs into a fair sum (about $30 to $50=£6 to £10), but, for amateur use, a press which can be used for prints up to 5 x 7 inches on mounts up to 8½ inches wide is commercially available. Lastly, some form of guillotine trimmer is needed for trimming print and tissue at one cut. The most convenient for the purpose is the "Merrett" trimming desk already described. Although this outfit mounts only the area of 5x7 at one dwell of the press, yet it must not be forgotten that it serves equally well for mounting larger prints at two or more dwells, and the final result shows no sign of having been achieved in several stages. Thus, for the above modest sum the amateur worker can deal with prints of

any size so long as one dimension does not exceed 7 inches, and with mounts of any size so long as one dimension does not exceed 8½ inches. The press may be heated by either a small spirit lamp, or, preferably, by a small gas burner, which keeps in action indefinitely and is more easily regulated. First, each print (untrimmed) is provided with a piece of tissue, by laying the latter in contact with the back of the print and giving a touch with the hot fixing-iron. This secures the tissue at one point, and it is well to attach tissues to the whole of a batch of prints before proceeding with the next operation, which is trimming print and tissue together in the ordinary way with a guillotine. We thus obtain the tissue exactly in register with the print, so that on the mount, after hot pressure, there will be no edge left unattached and no tissue protruding from the opposite edge of the print. All prints having thus been trimmed, the next step is to attach each at one point only to the mount. This is done by laying the print exactly where it is to go on the mount, and then, holding one corner down in place with the hand, by raising an opposite corner with the thumb and finger and giving a touch of the fixing-iron to the adhesive sheet. The latter is thus attached at one point both to mount and print, and all that now remains is to subject it to the hot pressure. The gas is lighted under the press, and the latter brought to the right heat. I say right, because the temperature does vary for different purposes, being higher the thicker the print. But there is a wide latitude for error, and, within wide limits, want of temperature may be made up for by a longer dwell of the press. If the press is too cold to melt the shellac properly, of course nothing happens. The extreme of temperature may be put down as 140° Fahr. to 190° Fahr., say 170° to 180° as a useful average, the print being given a dwell of five seconds. There is no difficulty at all in regulating the press to this heat. In preparing it for use, place the two mounting plates in it to warm up with it, and when the press has attained a steady heat, remove the two covers to the table, lay the one to be used (matt or polished, according to the nature of the print) face up, lay on it the print and mount face down (=mount

uppermost), on this lay the other mounting cover and the pressure piece of cardboard, and slip the whole back into the press. A five seconds' dwell of the lever will then secure the print firmly to the mount.

I am afraid that all this looks terribly formidable in print, but in actual work dry-mounting rattles merrily along, and, quite apart from the perfect flatness, permanence and rapidity of the method, one wonders how one could have remained so long content with the tedious and messy pasting methods. Boiled down into the fewest words, the process consists in: (1) Applying tissue by a touch of fixing-iron to the back of each print. (2) Trimming print and tissue together. (3) Adjusting print on mount and fixing there by touch of fixing-iron through tissue to mount. (4) Laying between mounting plates. (5) Giving a dwell of five seconds in the press.

If a print has to be removed from its mount, all that is necessary is to heat a mounting plate to 250° or 300° F., press the back of the mount upon it, and with a piece of rag press one corner of the print until it is seen to become loose. This corner is raised and the pressure applied to another, which is similarly detached from the mount, after which the whole print will readily leave the mount.

Multiple Mounting

This method of embellishing the photographic print originated in America. I well remember the first occasion on which its use was shown in England, namely by Mr. Holland Day at the Royal Photographic Society, in October 1900. The house exhibition of photographs by American pictorial workers then held was composed almost wholly of prints mounted in this way, though without much elaboration. In most cases, only two mounting papers were used, that immediately bordering the print and the back paper or mount proper. Since then, multiple mounting has been universally adopted as a means of enhancing or enriching a print, or of giving it its most effective setting.

In this application of the method, no one has approached Mr. Frederick H. Evans, well known to all visitors to exhibitions of the Linked Ring by his photo-

graphs of architectural subjects. Mr. Evans has brought multiple mounting to a degree of refinement which renders it more akin to the French method of surrounding a drawing by ruling ink lines and filling up the spaces between some of them with faint washes of color. In fact, Mr. Evans has shown by his work and his writings on the subject that the multiple-mount method, if skilfully employed, is capable of a far greater range of effects than any combination of lines and painted borders. I must acknowledge my indebtedness to Mr. Evans' paper on the subject before the Royal Photographic Society in February of last year, as well as to its writer personally.

In treating the subject, one must not forget that mounting, like the making of a photograph into which we endeavor to introduce pictorial quality, is largely, nay chiefly, a matter of taste. Too often it becomes one of fashion; but, in any case, it is foolish to suppose that one can lay down hard and fast rules and insist that they should be followed. There are certain principles by which one is guided in the use of a number of mounting papers, but it does not follow that a successful mounting scheme should be the embodiment of all of them. Therefore, in setting forth the factors which are concerned in the pleasing use of the method, I hope the reader will bear in mind that they are offered first of all as a means of preventing him from making glaring errors, but not with the object of discouraging him from exercising his taste and skill in other directions than those suggested. But let him not forget that a mount which impresses the beholder with its wondrous or clever character has failed in its mission. The best testimony it can receive is that it is felt to fit the print, but does not draw attention upon itself.

Governing Factors

The directions which opportunity offers for the making or marring of a print by the method of backing it up with tinted papers may be said to be seven in number: (1) Size of mount, relative to the print. (2) Position of print on the mount. (3) Color of the mount—in harmony with, or contrast to, the print. (4) Depth of color of the mount—light or dark. (5) Arrangement

of borders. (6) Choice of textures of mounting papers —rough or smooth. (7) The relation of the mount to the frame. I have placed these factors in the order in which they fall, to be considered when preparing a mount by the multiple method. I will first consider each, before passing to the methods in the practice of which they are applied.

Large or Small Mount

Under, this head, all that needs to be said is that the smaller the print the greater the *proportion* of mount which it will stand. A 3x4 print, placed with a suitable disposition of borders on an 8x10 mount, will not look lost, whereas an 8x10 print placed on a mount of the same proportional size, namely on an 18x30 board, will look over-mounted. A 6x8 print (upright) will look very well placed on an 11x15 mount, whereas, if it had the proportion just named for a 3x4 print, the area of mount would be almost exactly double this.

Placing the Print

The one place NOT to put it is in the geometrical center. Professional mounters still insist on thus placing a print, probably because it is the easiest thing to do. But the print which is placed at the center of a board *looks* dropped quite a good deal below the center. There are plenty of examples of this mistake on exhibition walls, but I give a pair of illustrations, Figs. 6 and 7, which will show the correctness of the rule that the space below the print should always be greater than that above it.

As regards the space which should be left at the sides of the prints, the classic rules are that, in the case of an upright ("portrait") print, the spaces on either side and above the print should all be equal; whilst in the case of a horizontal ("landscape") print, the spaces on each side should be equal to that below the print, the upper margin being somewhat less.

There is no doubt that the most pleasing and "correct-looking" effect is obtained by departing somewhat from these dicta of the authorities. For an upright picture, the top margin should always be a little less than those at the sides. These latter should be equal to each other and, usually, considerably less than the

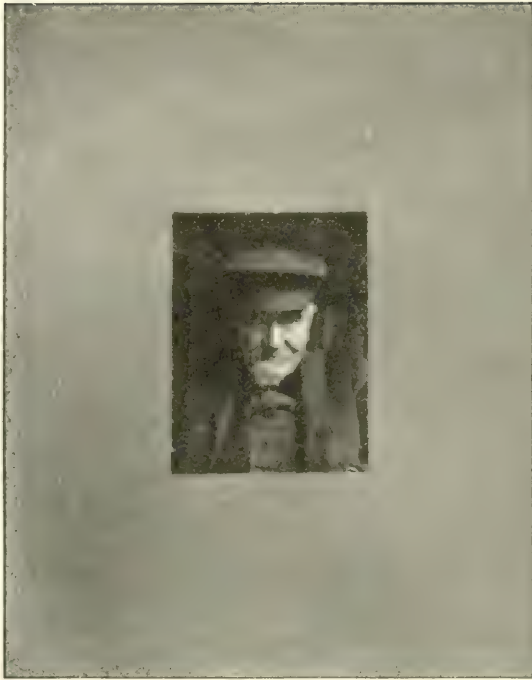


Fig. 6

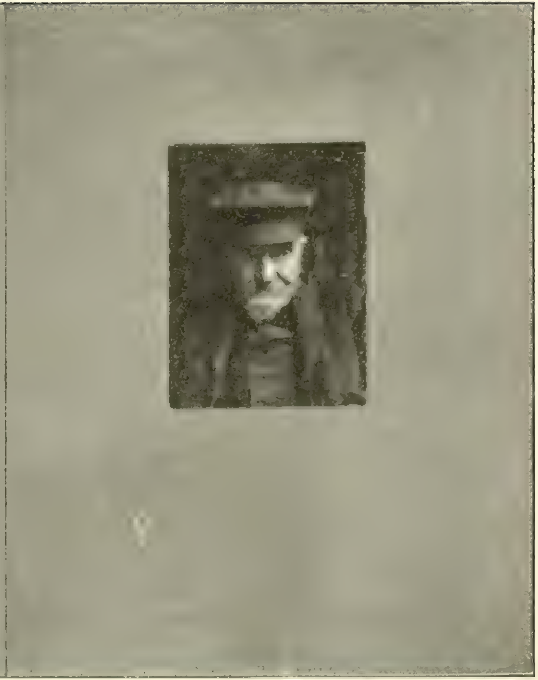


Fig. 7

bottom margins. In the great majority of subjects, it will be found that this rule is observed. An exception is a very long, narrow print. If the narrower top margin be adhered to, it has the look of having been chopped off by mistake. A print of this shape requires a top margin greater than those on either side, and it then looks as though the usual course had been followed.

In the case of a landscape print, the departure from the classical rule goes the other way. The side margins may be made broader, and the margin below the print made a little less, than those at the side. Here, again, there are exceptions. If we wish to accentuate the foreground in a print, it will be found well to have a broader margin of mount below. If, on the other hand, it is desired to give emphasis to the horizontal lines in a subject such as a seascape, or a subject where horizontal lines have been chosen for their suggestion of restfulness, the side margins are made broader with advantage. The effect is to increase the apparent width of the picture.

In every instance, the worker is advised to have the side margins equal, that is, not to place the print to one side or the other of the mount. Lines in the subject are sometimes thought to justify decentering of the print horizontally on the mount, but it almost always happens that the result savors of affectation.

Light or Dark Mounts

The principle on which the final or back mount should be chosen is that it should enhance, or bring out, the characteristic features of the print: but do not forget that its work in this direction can be overdone. A light mount will enrich a dark print, whereas a dark mount will show up a print in light tones, and emphasize the delicate gradations in the half-tones. Inversely, a very dark subject calls for a still darker mount to relieve it, and a print in which the tones are thought to be too light will be helped by placing upon a still lighter mount. And as it often happens that different parts of the print contain quite different areas of tone, the beginner may be excused for feeling puzzled as to which scheme of mounting is likely to serve best. The multiple system, however, is very flexible in this respect, in which connection I can-

not do better than pick out one bit of advice from Mr Evans' paper before referred to: "Supposing that our subject is a portrait against rich dark background, I would first suggest trying a light bottom mount; though at first this may seem quite wrong, for a dark subject or background seems naturally to call for a dark mount to relieve it. But you will find that very often a dark mount will rob your background of its depth and richness and that a suitably light mount will enrich it and give it new value. And here comes in the advantage of using three or more layers. There is a certain shock to the eye in a dark background coming direct onto a light mount, —it looks too cut out, or cut off; but, if this is bridged over by suitably toned intermediate papers, the shock is not felt. A case may occur where a light background must be kept as light as possible, and then a dark mount is best." In short, if one would put this part of the subject into the fewest words: To enrich dark tones, use a light mount; to heighten light tones, use a dark mount. To relieve dark tones, use a darker mount still; to relieve lightness of tones, use a still lighter mount. This is a crude statement of the subtle art of the use of mounting papers, but it may serve the reader in his first essays.

Color of Mount

The same principle of heightening an effect by contrast or diminishing it by sameness holds good as regards the color of mounting paper to be selected. The easist type of print to mount is one of pure black color, which spares us the problem of color to a great extent, and allows us to produce extra apparent coldness or warmness of color by choice of the mounting paper; those of bluish tint help the warmth of color in the print by contrast, while those of brown similarly serve to make the print appear colder in color. As a rule, black prints look best on neutral mounts, gray on white; in these questions of color fixed rules are more misleading than in any other section of our subject. Prints of brown color usually look their best when mounted in lighter or darker tints of brown; or of cream, if a very light scheme is being adopted. Similarly, blues go best on bluish mounts, whilst red chalk looks better on white than on anything

else. To reiterate our general rule, harmony relieves the effect of the print, whilst a mount of contrasting color accentuates it. For example, a sepia print gains greatly in richness when put on a dark green mount; but let us warn the reader that it is more difficult to go wrong when using harmony schemes than it is to go right when working by contrast.

Arrangement of Borders

The easiest mistake to fall into is to repeat the borders of equal width. There must be some design, or the mounting becomes meaningless repetition. The second error into which one readily falls is the use of borders of quite strong-colored paper. I must quote Mr. Evans again on this point: "No color should be selected or used which will have a final effect of color *as* color. If we do, we will inevitably spoil or vulgarize our print, and only achieve a garish, inartistic effect. Photography is a monochrome art, and we must beware how we endeavor to enrich it by means of color in our mounts. The tints of our paper must be such that they are felt only as low-toned washes or dividing lines." In other words, a mounting paper which cannot be tolerated for mounting purposes, when used as a border of any width, may be used with advantage when it projects from the paper above it to the width of only one-sixteenth or one-eighth of an inch.

Texture of Mounting Papers

I have mentioned this as a factor, but it is one of quite minor importance, for the reason that if we endeavor to humor our print in the way of suggesting greater roughness or smoothness by aid of the mounting paper, we greatly handicap ourselves in the choice of suitable tints of the papers, which is by far the chief consideration. It sometimes happens that a mounting paper of extra-coarse texture may be of service in conveying the suggestion of greater smoothness in the print; but, with the tremendous variety in the surfaces of photographic sensitive papers at the present time, there should be little call for the mounting paper to render such assistance as this. For securing tone effects, of course, the use of rough surfaced papers is often an invaluable aid, but this requires careful handling.

Frame and Mount

On this last point but one comment is needed. It is: Assign the duty of surrounding the print effectively either to the mount or to the frame, not to both. If the mount includes several borders, the molding should be of the plainest sort, a simple flat beading or the plain binding strip of a passe-partout mount. In case of a frame which is at all ornate, the best plan is to dispense with a mount around the print,—in other words, frame "close up."

Mounting Papers

In laying in a stock of papers, it is well to err in the direction of choosing the more neutral colors, light and dark. Papers of strong color will rarely be required, and give the beginner opportunity for mistakes. For choice, the reader can range over the cover papers of all manufacturers. Many of these are carried by photographic supply houses, or can be seen at the nearest printery.

Trying a Scheme

As regards the practical methods of forming the mount, we are indebted to Mr. Evans for very workmanlike methods described below, in some cases in the worker's own words. To save time when selecting tints, it is a good plan to go through one's stock and cut a small piece, say 5 x 7 inches, from each paper. To quote Mr. Evans: "I then true up each corner and sort them into lights and darks, etc. This forms a sort of palette of tints, and can be readily chosen from as we proceed. I choose what I think will be the best as a first layer and put the top left-hand corner of the print in position on it, showing the exact margin to be used. Holding them together in the left hand, I pick up the next chosen tint and place it behind the first two. Holding them out at arm's length, I try the effect of various widths; when satisfied, I place the next tint behind them and again test the whole. If satisfied, I place them on the final sheet (as near as possible in the proper position on it), with the left hand grasping the whole. Holding all up at arm's length and in an even light, the entire effect, as regards the top of the print at any rate, can be judged."

The First Paper

The print requires to be trimmed perfectly square and true at the outset, as any error will be magnified as each successive mounting paper is applied. The print is placed

on the first mounting paper and attached by a tiny dab of stiff paste, such as Higgins,' at one corner, the top right hand. This one touch of paste is made to serve for each successive mount until all are in place, for the reason that it lessens the chance of cockling. When the mount has been completed, a second touch of paste is given under each left-hand corner, and that is all the pasting done. In the case of some mounting papers which persist in cockling, it is well to put the paste behind the body of the print, not at the one corner only, though this plan does not make so neat a finish, the corners sticking up a little.

Trimming to Form Border No. 1

The best means is the guillotine trimmer. A knife used on zinc or glass leaves an edge or burr to the paper, very often quite spoiling the effect of the mount when seen in oblique lighting. The burr may be taken off by rubbing down with an ivory paper knife or the thumb nail, but this with some papers leaves a shiny surface which ruins the appearance of the mount. "Unless we are gifted with an accurate eye, it is best to mark the width to be cut away. I use a hard retouching pencil, and with it make a small dent on each side, top and bottom, where I want to cut. Placing this on the guillotine cutting-board, I make these dents come accurately at the cutting edge by denting the paper with the thumb just behind the pencil so that it will just be cut off. This will ensure perfect straightness, and, by placing a steel straight edge over the paper close to the cutting edge, the paper will not buckle as the blade comes down along it, however thin the paper may be."

Border No. 1 having been applied to the back of the print in this way, the same series of operations is performed to border No. 2, and so on until the mount is completed. The back mount comes last of all, its size and position being decided by the considerations we have already gone into.

Dry Muitiple Mounting

As practised according to the foregoing method, the multiple mounting system necessitates a print which lies perfectly flat on the mount when attached by the two upper corners only, and is therefore not suitable for

carbon, bromide, or other prints having a gelatine coating. Platinotype and plain papers are the only varieties of printing papers for which it is really suited. Using the dry mounting method, however, any print may be multiple-mounted; although in this case one is restricted to a lesser number of mounting papers, owing to the fact that each involves not only a paper but the thickness of the cementing tissue. Still, the dry mounting method is capable of most effective use, the manipulation as to trimming each mount to form the border being exactly as already described.

Multiple Mounts to Lie Flat

A final practical point, which we owe to Mr. F. H. Evans. It concerns the trouble with the multiple-mounted prints that, owing to their greater thickness in the middle, a pile will not lie flat. "One way out of the difficulty is to keep the mount as simple as possible, using the fewest number of papers one can, and then to use the last layer but one untrimmed. If we then treat the very last sheet as a cut-out mount, cutting the opening in it so as to show exactly the desired proportion of the last but one, which we left untrimmed for this purpose, and then lay the whole down on cardboard, the cut-out, especially if we can get its tint in a quite thick paper or thin board, will largely allow for the thickness of the papers inside it, and a pile of such mounts will be found to lie quite flat. I find it best, when using this method, to paste the untrimmed sheet on the cardboard foundation, lay the cut-out sheet onto it, and then adjust the print and its mounting papers in position in the opening, all having been scrupulously measured and squared-up first. The truing-up is more essential at every step in this method than in any other, as the cut-out sheet, when finally put into position, reveals errors in a most cruel fashion."

Framing

If it is difficult to lay down hard and fast rules in mounting, it is doubly so in the case of the selection or design of the frame. Fortunately there is not the need just now to lay stress on matters connected with the frame, the tendency being now to allot the chief duty of the embellishment of the print to the mount. And, here the

caution must be repeated—do not allow the frame to supplement the work of the mount. A severely simple and plain molding is all that is necessary to complete a print which has been properly and pleasingly mounted by the multiple method. Elaboration in the way of framing is fitting chiefly when the print comes close up to the inside rebate of the molding. When this is the case, it is probable that the majority of the ambitious effects in frames fall short of their aim; the notice of the observer is drawn away from the picture, not to it. One recollects Sir Humphrey Davy's famous comment on his visit to the Royal Academy, "What an extraordinary collection of fine frames!" Therefore, while the space now at my disposal is best devoted to the useful passepartout form of frame, one practical point may be mentioned here in regard to the ordinary pattern of frame.

Air-Tight Framing

The slipshod manner in which most frame-makers finish off their work is responsible for many of the short lives of photographic prints. It is usual to back the mounted print with one or two pieces of thin match-board, so that air and fumes from gas obtain access to the print from the back as well as in front, round the glass, which frequently fits none too well. To secure enlargements or any kind of photograph as much as possible from injurious fumes, the glass of the frame should first be secured in the rabbet with strips of good-quality paper stuck on with paste. Then the print is placed in, and on it the backboard (in one piece), which is secured with brads. A piece of stout brown paper is then damped, allowed to expand, and fastened with glue to the back of the frame only, not to the backboard. When dry, the paper will be as tight as a drum, and, should at any time the backboard shrink, no fumes will get in.

Passe-partout Framing

The passe-partout frame consists of a piece of glass and one of pasteboard, between which the photograph attached to a (thin) mount is laid, and glass and backing bound together with a gummed strip. The backing card carries the supports by which the passe-partout is suspended, usually a pair of brass rings about one-half

inch in diameter. The simplicity of this form of frame admirably adapts it for the protection of the multiple-mounted photograph. It is quite unsuited for photographs affixed to heavy or stiff mounts, as the binding is not strong enough to hold the latter flat in contact with the glass.

The first thing to do is to cut a piece of glass, a shade larger, say one-fourth inch each way, than the mount, which is to be made the meat of our pictorial sandwich. A piece of good pasteboard is then cut the exact size of the glass. The latter having been made perfectly clean, the mounted print is laid face down on it. The rings are fixed to the backing card by making two slits in the latter, and pushing, through each, one of the special forms of ring and fastener sold for the purpose. The fastener resembles an ordinary paper fastener, and, though it is very quickly and easily fitted, it has the drawback that it pulls out rather easily when cording the finished passe-partout, and, in the case of prints affixed to very thin mounts, the points of the fastener will sometimes perforate the latter unless a linen or stiff paper shield be glued over them. Therefore the more tedious plan of fastening the ring to the backboard by passing a loop of broad tape through the slit and gluing it to the inside of the board is preferred by many. Some workers also content themselves by running a single loop of tape or cord round through the two slits dispensing with the rings altogether, but this plan compels one to hang the passe-partout on one nail only, with the result that it is constantly getting crooked on the wall. The rings allow of two separate cords being attached each to a separate nail, so that when once it has been set straight the frame always remains so.

In any case, the rings having been affixed, the back and glass are bound together with the print between them. For this purpose the strips of Denison are very useful, as they are sold coated with a very strong adhesive of fish-glue. There are some twenty-two colors in the Denison passe-partout series, but most of them are much too bright in color for the framing of photographs. The No. 1 (black), No. 2 (white), No. 3 (gray), and No. 5 (brown), form a useful set to commence with.

whilst the gold strip suits almost any photograph or mount, but particularly vignetted prints or those having a great deal of very light tone in them. When starting, perhaps it will be found best to cut the binder into lengths suitable for the sides of the glasses, but with a little practice it becomes easiest to use the binder from the reel and turn over at each corner, as in binding lantern slides. When rubbing down the binder, apply pressure first on the edge and then on the front, on which side of course the binder must be laid perfectly even in width, allowing any unevenness to find its way to the back.

The Cloth-Covered Frame

Another form of frame, very appropriate for many photographs, and by no means widely known, is one formed preferably of binders' board, covered with book cloth. This was described for the first time in THE PHOTO-MINIATURE NO. 20, and its simplicity and usefulness abundantly justify its inclusion here. I quote Mr. J. Horace McFarland: There is no reason, of course, why a wooden frame should not be covered with cloth, but the advantage and beauty of the form, possibly original with myself, in which the basis is some form of binders' board, make it unnecessary to trench upon the excellences of the wooden frame. The cloth-covered frame is therefore flat, and it is somewhat of a hybrid between the conventional mat and a frame, because it continues the tone over a flat surface. Its extreme simplicity commends it, in that there is no interest taken from the picture when thus framed. Further, the flexibility as to color of this form of frame gives it an especial value. Book cloth may be had in almost endless colors and tones, and in a great variety of textures, so that one's feeling of appropriateness can be more nearly accommodated in this medium than in any other.

As I write I see on the walls various cloth-covered frames, illustrating their color adaptability. A fine trichromatic reproduction of a De Longpré peony study, in which the flowers are in deep reds, delicate pink and white, with yellow centers, the prevailing tone being crimson, is framed by three inches of dark maroon cloth, in pleasant harmony. A delicate picture of rare fungi by

W. Hamilton Gibson, done in light orange for the main color, is successfully complemented by a dull Turkish-blue frame. A favorite blue-print, toned to a deep and rather dull blue, with two interesting figures as the whole picture, is framed close up in dark blue, the frame being beveled toward the center, and a single gold line relieving the broad blue surface, about a half-inch away from the picture; the whole effect being harmonious.

A brown etching-effect portrait of my old friend William Kurtz, the veteran artist and photographer, is held in a deeper brown frame, and a delicate line portrait of Paderewski, most charmingly worked in black and white by Gribayèdoff, is mounted in a gray frame.

I multiply these instances only to show the great adaptability of the cloth frame. One can hardly fall afoul of a color not readily matched or contrasted by an easily available book cloth. A splendid and rare portrait of Abraham Lincoln, done in coloritype some years ago, with a dark orange background, was a rank failure on the wall until I found its fitting enclosure in a yellowish brown cloth.

The shades of gray give perfect effects with platinum and bromide prints, and the varied tones of carbon and gum may be most agreeably harmonized or contrasted with a fitting cloth. Further, if the worker has any sketching ability, he can do remarque etchings on the frame surface to any extent. The cloth is quite durable, and may even be washed off, in the more subdued hues, without harm to it, save a dulling of its surface—and this is sometimes a benefit, rather than a damage.

Making the Frame

The method of making these cloth-covered frames is simple, but the work is best done by a book-binder, accustomed to the handling of the board and the book cloth. I will briefly describe the process.

In order to have the directions definite, I will presume we are making a frame to take a glass $6\frac{1}{2}$x$8\frac{1}{2}$, which will agreeably take a picture printed on 5x7 paper, mounted on any suitable backing. (The 5x7 print may also well be worked in a frame with a larger opening; I am only taking the size mentioned as a convenient example.) We will have a frame $2\frac{1}{4}$ inches wide, speak-

Carnations
J. Horace McFarland
Illustrating the simplicity of the cloth frame

ing from the standpoint of picture-molding, and the net opening for the picture will be 6x8 inches, which allows ¼ inch on all sides for the "rabbet," in which the mounted picture and its protecting glass rest.

The "Face Piece"

First, we cut a piece of pulp-board (a smooth board used for paper-boxes and for tablet-backs) of fair thickness (that known as No. 40, in sheets 26x38, is proper, though any smooth board will answer) to the size of 10½ x 12½, having it exactly square. On this, purely for convenience in beginning the work, we mark out with a square and pencil a rectangle 6x8 inches, representing the final opening of the frame. (See Fig. 8.) We will call this the face piece.

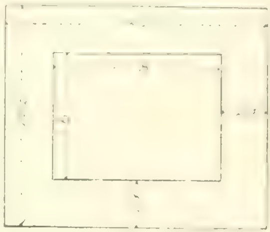


Fig. 8

The Strips

Now cut two sets of strips from a heavier board, and of a better quality than the pulp-board. That known as No. 20, in size 26x38 of a good quality of "straw-board," will answer, though a stronger and somewhat heavier frame can be made from No. 18 "binders'-board," 23x29. In passing, it may be noted that a number of frames may well be made at once, and that the aspiring amateur who attempts to cut tar-board, or even straw-board, with a knife and straight-edge will have a warm and unique experience! Better by far get them cut on the "table-shears" of the nearest binder, who may also be expected to furnish the board; and I may be pardoned the hint that the same binder's scrap pile may well furnish the strips for the frames. The only care, if they are thus obtained, rather than by cutting from the full sheet, must be to have them of uniform thickness or "number." (The designating number of binders' boards means simply the number of sheets in a commercial "bundle," which always weighs 50 pounds; and obviously the larger sizes of a given number are thinner, a point which will explain some discrepancies if remembered. Straw-

board is much lighter in weight, relatively to its thickness, and consequently much thicker in a given number, than tar-board or binders' board.)

The first set of strips for our frame are represented in Fig. 9; two are 2¼x12½ and the other pair are 2¼x6. These are for the first layer. The second set, made so as to allow for the "rabbet" and to break joints or corners, are 2x10½ and 2x8½, two of each. This set must be thick enough to equal the thickness of the glass and the mounts, if not, a third set may be cut, of the dimensions of the first set, and it will add strength as well as give a deeper rabbet. The whole matter of thickness and quality is relative; we need to get at least an eighth of an inch of depth in the rabbet, and any even board will answer. Wooden strips would do, but they are more trouble to work, far more liable to cockle and twist, and not so durable or inexpensive.

Back Piece

There may also be prepared a back piece of pulp-board or light straw-board, the same as the face piece, but one-half inch smaller each way, which would make it 10x12 over all. This is to enclose the picture.

Assembling the Parts

Now to the making, premising that for this work a slow-setting *flexible* glue is desirable—carpenters' glue is too harsh, and sets too quickly. Take the first pair of strips (A, on Fig. 9), brush them thoroughly with the warm glue, and lay them in position on the face piece, keeping flush to the top and bottom. Then glue and put on the smaller strips, keeping them even both inside and at the outer edges. It is important that the center opening is square and the previously drawn lines on the face piece will help in placing the strips accurately. Allow the embryo frame to "set" for about fifteen minutes, having it on a smooth flat table under an even weight.

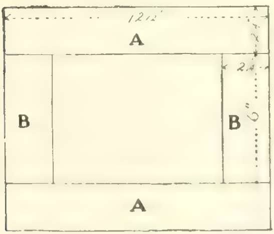


Fig. 9

Then proceed to glue and apply the second set of

strips, which are designed to "cross corners" with the first set. This set, being narrower, and placed flush on the outer edges of the frame, provides the rabbet, and the appearance of the frame at this stage is something like Fig. 10. Lay it aside under pressure another quarter of an hour to "set," after which cut out the opening through the face piece with a sharp knife—such a knife as shown in Fig. 3 will be suitable. The edges of the first set of strips serve as a guide for this cutting, which must be done smoothly, with clean corners—a "wabble" at this point will show very disagreeably in the finished frame. As the pulpboard is easy to cut, there ought to be no trouble in getting a smooth, even edge.

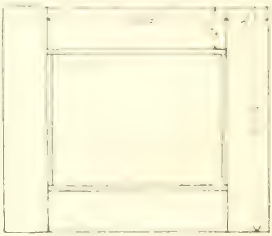


FIG. 10

Rounded Edges

It will be sometimes an advantage if the face of the opening is carefully and slightly rounded, which can be readily done with any scraping edge or with a shoemaker's rasp. When the opening is finished, put the uncovered frame away under even pressure to dry—it ought to stand overnight. (My practice is to make up a number of the uncovered frames in various sizes at once, and keep them until ready to use, then applying any color or texture of cloth demanded by the picture to be mounted. Special shapes and sizes, of course, will need to be specially made.)

Covering the Frame

Next comes the covering. Binders' cloth comes in rolls, and varies from 36 to 38 inches in width, the whole roll containing 30 to 40 yards. The textures found most useful are known as "Art Vellum," "Vellum de Luxe," "Buckram," etc. Any binder will have a sample book showing shades and patterns. Of course *any* cloth could be used for covering the frame, or any paper, for that matter; or it could be painted, gilded or enameled. The worker can turn his fancy loose—the cardboard

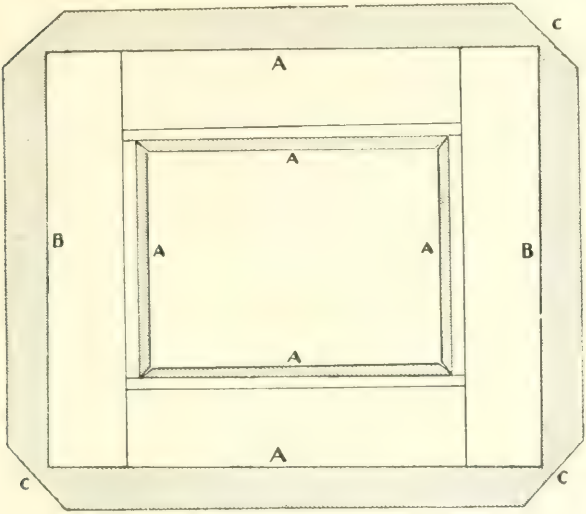


FIG. 11

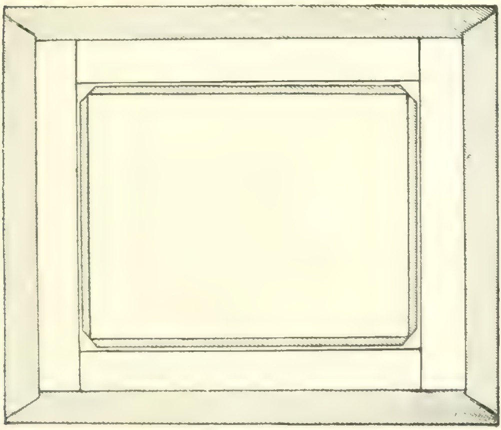


FIG. 12

frame is good material for his decorative ideas! But presuming on the practice of using binders' cloth, I say that we take a piece of it, cut a full inch and a half larger than the frame each way—13½ x 15½ would be the size for our experimental frame. Lay the cloth face down on a clean board, and brush into its back the hot flexible glue, working clear to the edges, but leaving a clean space of no certain area in the center, merely to save dirty fingers. The glued cloth should lie untouched for about two minutes, to give it a chance to become evenly moistened with the glue, thus avoiding wrinkles later. Lay the frame face down upon the glued cloth, and very carefully draw the edges over the edges of the frame.

Now, cut out the center, using a knife, and allowing something less than an inch on each side for "turn-in." The cloth when glued is quite flexible, and it must be worked carefully around the central opening, smoothing it down into the rabbet. The diagram in Fig. 11 will show how the corners of the cloth should be cut, after the frame is laid upon it, to facilitate folding. Inside, a simple diagonal nick will help the turning-in. In working on the face, use the hand only; to smooth the cloth into the rabbet, a bone "folder" or any similar round-edged tool may be employed.

There is a procedure which practice has shown to be the best for this covering work. Referring to Fig. 11, it is as follows: *First*, cut the corners with scissors, as marked at C. *Second*, turn in the edges marked A. *Third*, turn in the edges marked B, and nick the corners into shape with scissors and thumb-nail, working the cloth inside the rabbet with the "folder."

Framing the Picture

When this covering is done, the frame will look like Fig. 12 *on the back*. It is then ready for the glass and picture. The former should be carefully cleaned, particularly on the side to go next the picture, and both it and the picture laid in the rabbet, to which they may need to be fitted. A piece of paper should be laid over the back of the picture.

Now take the back piece formerly alluded to, and cut openings—mere slits—in it about two inches from the

top, and from each side, through which slip a strong linen strip or cord. Paste down on this, *inside*, a reinforcing piece of strong paper or cloth. Then coat the back piece carefully with glue around its edges, and lay it on the frame with its picture, covering the turned-in cloth, and leaving a neatly even margin all around. Press this down, place it under a moderate weight until dry, and your picture is framed.

De-Mounting Prints

I suppose this monograph would not be complete within its restricted sphere if it did not make mention of the method to be followed in removing a print from the mount. The use of extra-hot pressure has already been described in the case of the dry-mounting process. As regards prints affixed to the mount with other adhesives, such as starch, dextrine, gelatine, etc., there is only one formula, and that a very simple one. It is: Remove the mount from the print, not the print from the mount. In other words, the plan to follow is to pare off the mount with a sharp knife, starting from the back, and then, when it has thus been cut away as close as possible, soak in tepid water and remove the remainder by gentle friction with the finger.

GEORGE E. BROWN.

Notes and Comment

Dr. Otto Schott, the founder of the well-known optical glass works at Jena, whence come the wonderful glasses which have made the modern anastigmat possible, has been visiting the United States, and was the guest of the Bausch & Lomb Optical Co., of Rochester. Dr. Schott and his wife reached New York late in September, and went directly to the Seattle Exposition, visiting the principal cities and scenes of interest throughout the West.

When the late Professor Abbe was working out the practical application of his optical theories, he was confronted with the difficulty of obtaining suitable glasses. This was as far back as 1876. In response to his call for volunteers who would provide material in the shape of new optical glasses, Dr. Schott entered the field and, after years of systematic experiment, succeded in producing what was needed. The new glasses made at the Schott Works were tested by Professor Abbe, and it became possible with them to establish a definite relationship between given chemical compositions and optical results. So great was the interest aroused in this work that the German government lent its financial aid, and today the glass works at Jena are famous throughout the world.

Ibso is the name given to a new between-the-lens shutter, constructed on the sector system, giving speeds or exposures from $\frac{1}{150}$ of a second to one second, with bulb and time exposures as usual, and a safety lock which prevents accidental exposure. The Ibso has few parts, and its lightness and simplicity of operation together with its excellent finish and workmanship make it a very desirable shutter for the hand camerist. Despite its special features and capacity for high speed

work, the Ibso is retailed at a very moderate price. The Ibso shutter can be obtained through any dealer, Burke & James, Chicago, being the American agents.

Announcement is made that the Jury of the Sixth International Photographic Salon will be composed as follows: William Henry Fox, Director of the Herron Art Institute of Indianapolis; A. H. Griffith, Director of the Museum of Art of Detroit; John C. Johnson, a pupil of Whistler; E. H. Osthaus, a well-known painter of landscapes and animals; and George W. Stevens, Director of the Toledo Museum of Art. Communications concerning the Sixth Salon may be addressed to Mr. George W. Stevens, at the (Toledo) Museum of Art.

Quite a number of inquiries have reached us asking where transparent oil colors, suitable for lantern-slide coloring, can be obtained. For the information of those interested in this branch of work, we would advise that Winsor & Newton, Ltd., 298 Broadway, New York, offer two sets of oil colors, media and brushes for coloring lantern slides, in which the lantern-slide colorist will find all his needs supplied. Particulars of these sets may be found among the advertisements in this number.

Readers who can spare clean, perfect copies of THE PHOTO-MINIATURE Nos. 2, 3, 5, 8, 10, 11, 15, 16, 22, 24, 26, 29, 36, 51, 54, 61, 67 and 75, will confer a favor by sending us a list of what they can supply. These numbers are desired to complete sets of the magazine, and we will gladly pay a premium over and above the published price per copy.

An attractive little story, titled "The Sun Worshipper," comes to us from the Defender Photo Supply Company, of Rochester. It fits the waistcoat pocket, is attractively illustrated, and well worth sending for.

We are advised by the C. P. Goerz American Optical Company, of New York, and Burke & James, of Chicago, that arrangements have been made by which Burke & James will hereafter be the sole distributing agents for Goerz lenses in Chicago and the middle western states. Burke & James, in accordance with this arrangement, will carry in stock a complete line of the products of the C. P. Goerz American Optical Co., for the prompt filling of all orders. As they will be in a position to give the same terms and conditions of sale as can be obtained from the C. P. Goerz Company direct, dealers in the Middle West can save time by forwarding their orders to Burke & James from this date forward.

The demand for "Anastigmatics," that clever little booklet about lenses published by the Bausch & Lomb Optical Co., Rochester, N. Y., has necessitated a second edition, which is now ready for distribution. Most dealers have supplies of this little book, but, if not readily obtainable, a post-card to the Bausch & Lomb Optical Co., Rochester, will bring a copy.

The list of awards at the International Photographic Exposition at Dresden has been published. It includes many awards made to American exhibitors in all the photographic departments of the Exposition, but the list is too lengthy for publication here.

We may note, however, that special awards of honor go to the Harvard College Observatory; Percival Lowell, Flagstaff, Arizona; Prof. G. Hale, Pasadena, California; and Prof. R. W. Wood, Baltimore, Maryland, for prominent achievements in astronomical and color photography.

Gold medals in professional photography go to F. A. Bradley, E. B. Core, Gertrude Kasebier, and Pirie MacDonald, New York; J. C. Strauss, St. Louis; Frank Scott Clark, Detroit; Eugene Hutchinson, Chicago; E. E. Doty, Belding, Michigan, and Elias Goldensky, Philadelphia. In the industrial section, no American firms exhibited except the German branch of

the Eastman Kodak Company, whose exhibit was not entered in the competition. Awards of honor in this department went to Lumière Brothers for advancement in color photography, to C. P. Goerz and Voigtlander & Sohn for progress in photographic optics, and to the firm of E. Schering.

The new catalogue just published by the C. P. Goerz American Optical Company, 79 East 130th Street, New York, is notable, even among the many excellent lists put out by this firm, by reason of its richness of information about lenses, and beautifully printed illustrations, showing the capacity of the Goerz lenses in different departments of photographic work. The notes and definitions of astigmatism, spherical aberration, chromatic aberration, coma, curvature of field, depth of focus, speed, covering power and angle of view, are clear and concise and give the catalogue permanent value. The examples of the use of lens formulæ, enabling the reader to find the relation between the size of the object, the size of the image, and the focal length of the lens, hyperfocal distances, and exposures in telephotography, are also very useful. Following these, we have practical information on the choice of a lens according to its use, fully detailed descriptions covering the different lenses manufactured by C. P. Goerz, the XexcelL Sector shutter, ordinary and stereoscopic, the Tenax shutter, the Ango (Goerz Anschutz) Folding Camera, the telephoto Ango, and the tropical Ango, the Goerz Stereoscope, the Vest Pocket Tenax Camera and Enlarger, the new Goerz Folding Reflex Camera, the Autofoc-Tenax, the Manufoc-Tenax, the Goerz Special Balloon Camera, with focal-plane shutter, which makes use of the Lynkeioscope of twenty-four inches focal length, together with the Goerz ray screens, focusing glasses, binoculars and sundries. As these items indicate, the range of the Goerz specialties has been considerably enlarged of late, and the reader who desires to be informed about the new helps and conveniences available should get a copy of this new Goerz catalogue and give it the careful reading it deserves. Copies can be had from the

address given above, upon request, accompanied by six cents for postage.

More than one reader of THE PHOTO-MINIATURE No. 97 has expressed to us his disappointment over the difficulty of finding in the American market some of the small hand cameras of European manufacture. We, therefore, note with pleasure that the Gaumont Company, 124 East 25th Street, New York, is now introducing in America the famous Block-Note cameras, which, for fineness and accuracy of construction with extreme lightness and lack of bulk and size, are unequaled by any other instruments of their class. Messrs. Gaumont have published a catalogue describing and illustrating the Block-Notes Nos. 1 and 2, together with the Stereo Block-Note No. 2, which can be had on application; those who can, however, should take the opportunity of a personal examination of the Block-Note, by which alone its many remarkable features and exquisite quality of workmanship can be properly appreciated. An illustration may be of interest. Block-Note No. 1, when closed, measures only 1x2½x3½ inches, thus fitting the vest pocket, or the ladies' hand-bag, with a weight of only ten ounces. This little camera takes plates 2 5/16 x 1 ¾ inches, and the instrument is brought into position, shutter set and finder ready for use, by two simple movements. The lenses supplied with the Block-Notes are of the highest grade only—Zeiss, Goerz or Voigtlander. This fact, together with the rigidity of the apparatus and the smooth movement of the shutter, assures the highest quality of optical definition in the negatives, which, in turn, makes the obtaining of fine enlargements from these small negatives a simple and satisfactory operation. For the tourist, scientist or specialist, as well as for the amateur who wants the best possible results without bulkiness in apparatus, the Block-Note is an inspiration.

Books and Prints

All books noticed in these pages may be obtained from the publishers of THE PHOTO-MINIATURE, and will be promptly forwarded, postpaid, to any address on receipt of the publishers' prices as here quoted.

London. By Alvin Langdon Coburn. 20 plates; with an introduction by H. Belloc, M. P., New York, Brentano's. London. Duckworth & Co. Price $6.

Under this alluring title Mr. Coburn has gathered a remarkable series of photographs, taken from negatives made during the last five years, giving us his impressions of the great metropolis. Mr. Coburn's views of London are interpretations rather than matter-of-fact records of the great city. To their making he has brought a lively imagination, together with a keenly sympathetic appreciation of beauty. His London is perhaps not the London with which the man on the street is familiar. Nevertheless, it is always London—as an artist sees it, or as a poet would make us see it.

We are all familiar with the beautiful prints in gum and platinotype by which Mr. Coburn has made his reputation. Latterly he has come to recognize in photogravure a method capable of producing prints comparable to his highest achievements in gum platinotype and, at the same time, a method which enables him to make such a publication as the present one possible. Every plate in the series under notice has been made by Mr. Coburn himself and the prints pulled by his own hands; so that the possessor of this portfolio has, at a very slight cost, twenty original prints by Coburn, which, as individual prints in gum platinotype, could not be purchased for fifty times the price of the portfolio.

We note that Mr. Coburn is at present exhibiting at the autumn Salon of the Goupil Gallery, London, the

original photographs of the subjects in his "London" portfolio. It is to be hoped that we shall have this exhibition among the winter's offerings at the Photo-Secession galleries.

Photographic Optics and Color Photography, including the Camera, Kinematograph, Optical Lantern, and the Theory and Practice of Image Formation, by George Lindsay Johnson, M. A., M. D.; 404 pages, with 14 full-page plates, 5 in color and 170 illustrations in the text. Price $3 net. New York, D. Van Nostrand Company.

The complaint is sometimes made that our photographic text-books lack seriousness and thoroughness, and do not sufficiently take account of the scientific side of the subjects they discuss. Those who seek a comprehensive text-book of photographic optics and color photography, in which the subject is treated with that precision and thoroughness it deserves, will find in the work here noticed a volume which will abundantly satisfy their aspiration. The need for a deliberate and well-digested summary of the theory and practice of photographic optics, and its close relationship with the many new problems in color photography, has long been apparent. Those who seek up-to-date information in this department will find Dr. Johnson's work a veritable storehouse of interest. The chapter dealing with the optical lantern is particularly welcome, as including descriptions and illustrations of recent apparatus. The appendix contains many useful tables and formulæ.

Youth
C. C. Kough

The Photo-Miniature
A Magazine of Photographic Information
EDITED BY JOHN A. TENNANT

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Toning Bromide and Gaslight Prints

Years ago, in attempting to explain the popularity of the colored photograph despite the vileness of the average example, the writer fell back upon "the irresistible charm of color, universal and existing in all times and among all sorts and conditions of men since the beginning of the world," There can be no other explanation of the growing popularity of the "toned" bromide and gaslight print. People weary of black and white. So, in spite of this and that, the world no sooner learned to appreciate the development print, with its wonderful range of blacks through all the grays to white, than it clamored for variation along the lines of color.

The purpose of this monograph is to satisfy this craving for color, by telling the most advisable ways and means, with methods and formulæ, for securing almost any tone or color effect desired in the print, so far as is practicable. In these pages the bromide print and the development or "gaslight" print are considered as belonging to the same class, although the one is technically a gelatino-bromide and the other a "washed chloride" product. This difference may be disregarded in practice, except as explaining causes of failure when this or that paper refuses to give a satisfactory toned print.

There is a wide difference in the behavior of different papers in these toning processes, and this is the most significant fact in the whole matter. Manufacturers of

both kinds of papers have largely modified, or are modifying their products to meet the desire for toned prints. But, at this moment of writing, it is not possible to give toning methods applicable to all papers. Except in following a definite method given by a manufacturer for a particular paper, all our present toning methods are experimental, which is not to say that they are impracticable or will not give satisfactory results. The methods herein given are all practical, in the sense that they have been tried and proved. The reader, whose careful study of what follows is asked as the price of a practical introduction to the most reliable methods, may rightly take it that the space allotted to any process is a fair indication of its practical value. To include every curiosity in the way of a toning process which man in his folly has devised would make a book bigger than this can be, and would be a waste of ink and paper. Further, by way of introduction, we do not propose to include here the methods given by manufacturers for use with specific papers. This would simply mean the reprinting of many pages from manufacturers' booklets, all of which can be obtained from the manufacturers themselves, upon request. Thus, those who desire certain and reliable methods for toning Velox or Nepera papers should get the Velox Book; for Cyko papers, the Cyko Manual; for Argo papers, the Defender Tipster; for Kruxo papers, the Kruxo Manual; for Barnet and Leto papers, the Barnet and Leto Toners leaflet, and so on. All of which applies equally to papers made in Britain—too numerous even for mention here. Apart from these "official" processes, we have a large variety of methods and formulæ well worthy of consideration.

Toning Processes

In this monograph we shall concern ourselves mainly with those which fulfil the three chief requirements, namely: (1) Certainty of results; (2) the use of few baths; (3) the production of permanent prints. If the result as regards color, vigor, etc., is beyond the control of the worker, the process is of very little practical use. Equally so, if the toning involves a whole string of operations, the final outcome of which is usually—a spoilt print. And, lastly, a process which—however

satisfactory it may be in other respects—impairs the undoubted permanency of a black-developed print is not one worthy of adoption. In one or two other respects, processes vary chiefly as regards the depth or intensity which the print must have in order to produce the most satisfactory result when toned. Thus, prints to be toned with uranium require to be distinctly on the pale side, whilst those for sulphide toning are best a little vigorous. One or two other methods, on the other hand, require the use of the costly gold or platinum salts. The latter, except under exceptional circumstances, are far better employed in the legitimate form of platinotype or other platinum paper; bromide prints toned with platinum will probably cost more, and will never have the absolute permanence peculiar to the platinum print.

Advisable Processes

Placed in rough order of merit, the processes available are: Sulphide toning (hypo-alum toning is a cheaper, slower, and not quite so effective form of this method, whilst the thio processes represent sulphide toning at its best); copper toning; toning by re-development; uranium toning; with platinum toning, methods for blue, green and other tones grouped together, last, on account of their cost or infrequent usefulness. These methods differ, not only in the results which they give, but also as regards the perfection with which each attains its particular effect; on the principle of the lady in the play who spoke the "absolute truth under the circumstances," each may claim to be included among the really serviceable processes.

The Principle of Sulphide Toning

In the sulphide process, the image which, in a black-developed print, consists of metallic silver in fine division, is converted into silver sulphide, a substance which in the ordinary way is also black, but when produced in a fine condition on a photographic print is brown to sepia color. Silver sulphide is a most permanent substance. Therefore a sulphide-toned print should be permanent, too, a conclusion which is fully borne out in practice. A sulphide-toned print is at least as permanent as the bromide from which it is made.

The image of the latter is susceptible to practically only one agent likely to come in contact with it, namely sulphur fumes from burning gas, which partially sulphurize it and give rise to iridescent markings resembling those due to stale paper. Now, as the sulphide-toned print is the result of this sulphurizing process carried out with intention to a state of completeness, the result should be —and proves to be in practice—immune to this one cause of defacement.

In converting the silver image into one of silver sulphide, the method is to first act on (bleach) the silver image with some reagent which will change it into a compound of silver susceptible to the action of sulphide. Iodine has been used for this, giving an image of silver iodide. Bromine gives one of silver bromide. A mixture of potass bichromate and hydrochloric acid gives silver chloride, as does also a solution of chlorine, though in the former case the presence of the chromium compounds affects the color obtained. But the best of the lot is a solution of the two substances potassium ferricyanide and potassium bromide, which forms an image of silver ferrocyanide and silver bromide. Both of these are converted into silver sulphide when treated with a solution of sodium sulphide. In the case of the hypo-alum process, in which the prints are toned direct (without bleaching) in a mixture of hypo amd alum, the image is also changed into silver sulphide, but only to a partial extent. Theoretically, the method is not so good as sulphide proper; it is much more inconvenient in practice except on a commercial scale, while the results cannot be said to quite equal those by the sulphide process as regards permanency.

The "Bleach"

So much by way of theory. We will now give the formulæ for the two solutions required in the sulphide process. The first of these is the "bleach," or oxidizing mixture of bromide and ferricyanide. Within reasonable limits, the proportions of these salts and the quantity of each in the solution does not matter very much. Each chemical can, if desired, be kept in a separate solution if care be taken to keep the mixture in the dark,--that is in a cupboard where it will not be exposed constantly to

daylight. The ferricyanide suffers in time by exposure to daylight; but, as both it and the bromide are comparatively cheap and serve for a large number of prints, there is no need to take excessive care. The ferricyanide-bromide mixture, however, keeps very much better than a plain solution of ferricyanide alone. Formulæ which place the salts in separate solutions are a mistake. As good a formula as any is: Potass ferricyanide, 300 grains; potass bromide, 100 grains, water 20 ounces; Ammonium bromide may be used in place of the potassium salt in the above formula; the difference is not marked, but the ammonium compound tends to give a somewhat warmer brown or sepia. In the case of many formulæ, it will be noticed that equal quantities of bromide and ferricyanide are recommended. Although, as just stated, variations in the formula are not at all marked in their effects, a proportion of bromide over one-quarter of the ferricyanide does tend towards the yellowish color of which complaints are now and again heard. I want to make it clear that the opportunities for going wrong with the bleacher are very small indeed. Without encouraging the reader to be careless let it be said that "any old formula" (of ferricyanide and bromide) for the bleacher will prove successful. Not so, however, in the case of the sulphide solution, which requires to be very carefully made up and used.

The Sulphide Toner

Sulph*ide*, not sulph*ite*. The material for the toning or darkening of the bleached print is the chemical substance, sodium sulphide, of the formula $Na_2S.9H_2O$. This is purchased as small crystals which greedily absorb water and rapidly become almost liquid if not properly corked. Not that this totally unfits the sulphide for use. Sulphide which has gone liquid will at all times be found to work perfectly, but it is of course open to suspicion, and, in any case, it is not possible to know what is the strength of a solution made up with such a supply. For this reason, it is best to make up the sulphide into solution of 20 per cent strength, and add this to water to make the toning bath. And it is here that a caution must be noted. The weak working solution, which is only about 1 to 2 per cent strength, keeps very badly

indeed, and should be made up fresh from the stock solution at the time of toning each batch of prints. This is one of the most necessary items to bear in mind in using the sulphide process.

Varieties of Sulphide

Sodium sulphide is sold in various degrees of purity, and the label on the bottle is not always in exact correspondence with the condition of the substance inside, but the two forms which must be adhered to for sulphide toning are the ordinary "pure" and the "pure for analysis." The former can be obtained from any reliable drug store or photographic dealer. It comes in small lumps, yellowish to greenish in color; when dissolved in water the solution will be yellow, and will usually show a deposit which must be filtered off. This sulphide will give tones which are sepia brown with most papers. In the case of the "pure-for-analysis" sulphide, which is the recrystallized variety, the salt will be pure white and will form a quite colorless and clear solution in water. The tone given by this kind of sulphide is usually of a more purplish color. The distinct difference between the two commercial varieties of sulphide should not be overlooked, as it allows the worker to modify the process usefully when dealing with papers differing (as all papers do) to a slight extent in their adaptability to sulphide toning. The purer form has certainly much better keeping properties than the other, but either, if made up in 20 per cent solution, keeps for a month or two at least—which is enough for all purposes. The chief difference between the two is noticed in the diluted or working solutions. That of the purest sulphide *may* be kept and used again, though it is not really good policy to do so.

The supply of sulphide should therefore be dissolved as soon as purchased, as follows: *Stock sulphide solution.*—20 per cent; sodium sulphide 4 ounces; water to make 20 ounces. The actual toning solution is made up at the time of treating the prints by mixing the above stock with water, as follows: *Sulphide toning bath.*—Stock 20 per cent solution 3 ounces; water to make 20 ounces.

This makes a bath which contains about one per cent

The Quarry Team
F. C. Baker

The Beeches, Eagles Mere, Pa.
William H. Rau

real sulphide, corresponding with about a 3 per cent solution of the sulphide as purchased. If the bath is much weaker, the tone obtained is usually not quite so good; while, if it is stronger, there is danger of the print's blistering while toning, or afterward in the washing water. Indeed, some papers need to be toned in a weaker bath, and require also to be fixed in an alum-hypo fixing bath (see later), so that the strength of the toning bath given above may be taken as the maximum, and used at half or one-third strength, as circumstances show to be necessary. And, to repeat the caution once more, the toning bath is to be thrown away as soon as the prints have been passed through it. With these points in our mind as to the making up of the solution, we can come to the process proper.

The Standard Process

The prints require to be well washed and free from hypo before being placed in the bromide-ferricyanide bleacher, because any hypo in conjunction with the ferricyanide will form the well-known Farmer's reducer, and cause patchiness of the prints. It is immaterial whether the prints are taken direct through the toning process or dried in the meantime. Some workers contend that the toning process is more regular if the prints are dried before bleaching. In either case, immersion in the bleacher will cause the fully developed bromide to disappear, leaving only a faint brown image behind. In some cases the image is fainter than in others, the difference appearing to depend chiefly on the developer employed. Developers with a liability to stain will give prints which do not bleach out so completely as those made with cleaner working developers. But, in all cases, two to three minutes' action of the bleaching solution will be ample; if all pure black is not gone in this time, it is a sign that the bleach is becoming exhausted. The prints should be kept constantly on the move whilst in the solution, and turned over and over to ensure equal action. They are then given quite a brief rinse in running water—half a minute to a minute—and then transferred to the sulphide solution, where they should darken to the full brown or sepia tone in a few seconds. It is well always to leave them here for twice to three

times the period required to give the full tone. A wash of half an hour will remove the salts left in the film.

Most Important

Granted that bleacher and sulphide are in proper working order, there is one further factor in the making of sepia prints which is of vital importance, and that is the proper preparation of the print itself. A good sulphide tone presupposes a good black and white bromide. Not only that, defects in the bromide which may lie latent while the print is untoned come to light in the sulphide bath. This applies to uneven fixation (due to omission to keep prints moving in the hypo bath) and fingering of the surface; while, as regards the original development of the print, making the best of a wrong exposure will not do when sulphide toning is in view. A print that is forced by long development will suffer in tone, the result being colder and less satisfactory as regards vigor. Full exposure, and development which is complete in the normal time for a perfect black print, are the conditions for a good sepia tone, and, when a batch of prints is being put through, it is well to take steps to preserve a uniform time of development in order to secure an identical tone throughout.

Effect of Different Developers

Some developers do certainly differ in favoring the production of a good tone. About the best two are the all-popular metol-hydroquinone (M. Q.) and amidol (diamidophenol), largely used in Great Britain as a developer for bromides and "gaslight" papers. These tend to give a rich warm color, while metol tends to give a cooler brown. At the time of writing the present lines, I see in "Photographic Scraps" a note by Mr. Harold Baker on this point. He says: If I wish to secure a rich warm sepia color from an average negative, I use a developer containing more hydroquinone than metol and plenty of potassium bromide: I use sodium carbonate as the alkali, and take rather less sodium carbonate solution and more metol-hydroquinone solution than if I were printing for black prints. For a cool sepia I use equal parts of metol-hydroquinone and potass carbonate solutions, and my exposure would be half as long as that for warm sepia.

Possible Failures

The most common source of failure is a stale sulphide bath. The first sign of the bath going off is yellowness of the tone. A still staler bath appears to be non-active, giving only a pale brown tone, often described as "yellow;" whilst in its last stages of staleness the sulphide solution will actually remove the pale image which remains after bleaching. These effects are chiefly due to the formation of hypo in the sulphide bath. They will not be encountered if the bath be renewed at each time of working, or when it is seen that the color is falling away. If a sulphide solution fails to give the full strength, toned image in half a minute, it should not be kept on longer, but the print should be washed and put aside for treatment if this is thought worth while. It will be found that a freshly mixed sulphide bath will *not* put matters right. The stale bath has actually acted, but it has produced a faint sulphide image apparently, whilst in the case of a very stale bath there may be little or nothing left on the print to form an image, the hypo in the sulphide in conjunction with the ferricyanide having acted a reducer.

The best remedy in these cases is to make a new print and start again, unless the print be a big enlargement, the cost of which makes it advisable to spend time and chemicals in the recovery of the image. If this be so, the print which has failed to darken, or has done so only to an undesirable color, is put in a bleaching bath made as follows: Potass bichromate, 200 grains; hydrochloric acid, strong, one ounce, fluid; water to make 20 ounces. The action of this bath very likely will not show much, but the bath should be left to act for 20 minutes or half an hour, at the end of which time it is washed and re-developed in a strong developer as ordinarily used for bromide prints. This also will take time. It may be well to give some exposure to strong daylight; but if it succeeds we shall get back our print with full vigor and color, black or warm according to the speed or slowness of the re-development. If not now warm enough in tone, it can be put through the sulphide-toning process afresh from the start. This, I would explain, is treatment which is necessary only in

extreme cases of refusal to come up in the sulphide. In ordinary instances of inferior tone, the print may be rebleached in the bichromate, or in the following: Make up solution No. 1—Potass bromide, 150 grains; potass bichromate, 90 grains; water, 5 ounces. No. 2—Sulphuric acid, strong, 160 minims; water, 5 ounces. Mix these in equal parts for use, and, after bleaching washing, place the print in a fresh sulphide solution of proper activity. I am reluctant to give these prescriptions, and do so almost against my better judgment, because they suggest occasions for failure to which the worker will be a stranger if he will look after the state of his sulphide bath. But many fail to realize that sulphide is an erratic reagent, and, when stale, not only refuses to act, but brings the print into a state in which even a fresh sulphide bath is also useless.

Cautions re Sulphide

A caution should also be uttered as to keeping solid sulphide and solutions of it away from stocks of plates or sensitive papers of any kind. The vapor of sulphide will affect unexposed dry-plate and papers even more energetically than it does the bleached bromide print, and cause insensitiveness and the other effects which are usually associated with aging of materials. Thus, plates will show fog and iridescent stain; bromide and gaslight papers will give flat and dirty prints; and P.O.P. will assume a metal-like glaze on its surface and refuse to tone. This does not mean to say that a room where photographic materials are kept is sacrosanct so far as sulphide-toning is concerned. As I have already mentioned, the chief development of sulphide vapor takes place when the baths are thrown down the sink, or otherwise largely diluted with water. And, fortunately, we have a cheap and effective destroyer of every trace of sulphide in a solution of potassium permanganate, a bottle of which should be kept at hand and used over the sink after sulphide toning and for cleansing perfectly any bottles or dishes. Where permanganate is not at hand, a solution which serves equally well as a sulphide destroyer is potass or soda metabisulphite, or even ordinary soda sulphite with some hydrochloric or sulphuric acid added. In either case the sulphurous acid

destroys the sulphide, the sulphur in both compounds being thrown down as a yellowish milk.

Papers Which Blister

Blisters on sulphide-toned prints are not always due to the paper. The use of a very soft (lime-free) water-supply will give rise to them. In either case, a preventative will usually be found in the use of an alum-hypo solution as the fixing bath. A suitable bath is: Water, 64 ounces; hypo, 16 ounces; sodium sulphite, 1 ounce. When dissolved add; glacial acetic acid, 1 1/2 ounces; potash alum (dissolved in 5 ounces of water) 1 ounce. This mixture should be only very slightly cloudy. In it prints feel leathery to the touch in about half a minute, but the bath should not be kept in use so long as to leave a print still soft after one minute immersion.

Variations of the Standard Process

The process described in the foregoing paragraphs is that to be adopted for regular work. It has stood the test of time, and is in every way dependable for both amateur and commercial work. If I do not apply these epithets to one or two varieties of the sulphide methods, it is not to say that these latter are not practicable processes, but considerations of cost, time, simplicity, or result, have not combined in their favor as in the case of sulphide procedure. First I must mention one or two bleachers other than sulphide. One is a solution of: Iodine, 40 grains, in potass iodide, 110 grains; water, 10 ounces. In making up this formula, the best plan is to place the iodide in a measure and just cover it with water, then add the iodine, which will dissolve at once (it will not do so if the full 10 ounces of water are used), and finally making up to 10 ounces. This bath bleaches a print very quickly, but it also turns the paper as a whole to a deep blue in consequence of the starch in it forming iodide of starch. Thus it is not perfectly easy to tell if the print has been completely bleached or not. It is necessary to this end to place the print in a solution of: sodium sulph*ite*, 60 grains; sulphuric acid, 20 minims; water, 10 ounces, afterward washing well for a few minutes before transferring it to the sulph*ide* bath. A weak solution of metabisulphite of potash may be used in place of the sulphite and acid

equally well. While this iodine method is theoretically perfect, it has two drawbacks of cost and difficulty of telling when bleaching has been fully done.

Another bleacher is a weak solution of bromine in water, made by dissolving commercial bromine (liquid) in a large quantity of water so as to give an orange-colored solution. This makes a splendid bleacher except for its very irritating vapor, which affects the eyes badly and is really unusable on anything like a large scale unless there is plenty of ventilation. The print bleaches very quickly and may be placed direct, without washing, into the sulphide, although, if no wash be given between, the sulphide is soon used up.

Piper's Bleacher

Still another bleacher worked out by Mr. Welborne Piper is as follows: It has the merit of avoiding the slight softening or weakening which takes place when a print is toned by the usual ferricyanide-bromide bleacher.

The print is placed first in a solution of:—*A*. Ammonium bichromate, 1 ounce; ammonium bromide 1 ounce; water 20 ounces. Here it should remain for about 6 minutes, very little difference being observable in its appearance. After a rinse under the tap, it is then bleached in: *B*. Ammonium bichromate, ½ ounce; ammonium bromide, ½ ounce; potass ferricyanide, 2 ounces; ammonia (concentrated, 880), 1 dram: water to make 20 ounces. Here the print soon bleaches to a fairly distinct brown image. If the action is slow, a little more ammonia is added. The print is washed until free from yellow stain and then toned in the sulphide bath.

For a warmer tone, the process is varied by using the following bath, *C*, in place of the *B* given above: C. Ammonium bichromate, 1 ounce; ammonium bromide, 1 ounce; water to make 20 ounces; nitric acid, 20 minims.

Bennett's Method

The only other variation of the sulphide method first detailed which is deserving of mention is that in which a whole series of tones from brown-black through brown to warm brown is obtained by taking advantage of mercury for bleaching, in conjunction with the ferri-

After Lunch
Edgar A. Cohen

Bolinas Bay Road, California
Edgar A. Cohen

cyanide-bromide solution, and of Schlippe's salt for darkening, instead of or in admixture with the sulphide bath. There is every reason to assume that the prints made in this way are just as permanent as those sulphide-toned by the simpler process; the mercury here is converted into sulphide, and in each case the compound is a very permanent one. Still, the method requires some considerable care in working when aiming at a number of prints all alike in tone. Mr. H. W. Bennett, its chief advocate, recommends the following formulæ:

Bleachers.—A. Solution of potassium ferricyanide and bromide, as given already on page 295. *B.* Mercury bichloride, 120 grains; potassium bromide, 120 grains; water, 10 ounces.

Toners.—a. Solution of sodium sulphide, see above. *b.* Schlippe's salt (ammonium sulphantimoniate), 4 grains; water, 1 ounce. Like the sulphide, the Schlippe's salt should be kept in strong solution (10 per cent), and added to water to give a solution of the *b* strength. The following table, due to Mr. Bennett, will give an idea of the tones obtainable when working on this system. Allowance requires to be made for the fact that the mercury when used alone, or in large proportion to the ferricyanide, A, solution, intensifies as well as tones.

Color	Bleaching Solution	Darkening Solution
Pure black	*A*, 1 part; *B*, 1 part	Solution *a*
Brown-black	*A*. 2 parts; *B*. 1 part	Solution *a*
Deep brown	*A*. 3 parts; *B*. 1 part	Solution *a*
Dark brown	*A*. 5 to 7 parts; *B*, 1 part	Solution *a*
Rich warm brown	Solution *A*	Solution *a*
Red chalk	Solution *A*	Solution *b*
Red-brown	Solution *A*	*a*, 1 part; *b*, 7 parts
Very warm brown	Solution *A*	*a*, 1 part; *b*, 4 parts
Warm brown	Solution *A*	*a*, 1 part; *b*, 2 parts

Also, whenever it is used, either alone or combined with *A*, the bleached prints, in addition to usual washing, should be given two or three soaks in hydrochloric acid (strong), 1 dram; water, 10 ounces; and again passed through several baths of clean water before being placed in the sulphide or sulphide-Schlippe bath.

Thio Toners The variations of the standard process already described depend, as will be noticed, on different bleachers. In no instance is the process so simple as the standard method, while the results are no better than those by the standard bleacher. In the case of the thio toners, now to be dealt with, the standard bleacher of ferricyanide and bromide is used—but, in place of sulphide, toning compounds are employed which have decided advantages over sulphide, both as regards freedom from smell, keeping qualities, color and vigor of the print. Therefore, while I place the methods involving a different bleach second to the standard method, I put these with the thio toner in a higher class than the standard,—they are in every way better processes. They depend on the use, instead of sulphide, of certain thio salts (thimolybdate or thiostannate), the action of which on the bleached print is, in a general way, similar to that of sulphide. I will deal with thiomolybdate first.

Thiomolybdate Toner This compound, as a substitute for sulphide, is the invention of Mr. Harry E. Smith, and is available only in the form of a concentrated solution supplied by Mr. Smith's firm, Edmund and Co., Ezra St., London, E. This solution is mixed with water in the proportion of 5 drops or minims to the ounce, to form the toning bath. The bath has certain very positive advantages over sulphide. The concentrated solution keeps perfectly in a stoppered bottle for from one to two years at least and in a well-corked bottle for many months. The bath, diluted for use, keeps in good working condition for several weeks. At the same time, as with sulphide, it is recommended to make up a fresh bath from the concentrated solution for each batch of prints, and, unless a very large quantity is made up, not to use the bath a second time. Its odor is practically only that of weak ammonia, it is not liable

to give bad yellow tones. This is a great advantage in the case of gas-light prints, which often take a very yellowish tone with sulphide, and, lastly, it gives a toned print of slightly additional vigor, instead, as is the case with sulphide, of slightly reducing the vigor, that is, softening the print. In other words, a print which is just right for a black "color" will give a perfect print when toned with thiomolybdate; whereas, for full vigor with sulphide, it is well to have the print a little (not much, it is true) over as regards contrast and depth. The prints are bleached in the usual way, washed for a few minutes, and placed for full five minutes in the thio toner, made as just directed. Longer immersion in the toner will not harm the print, but, to get the full richness of color, full five minutes should be given. The prints are then rinsed and passed for five minutes into a bath of: Ammonia, 1 ounce; water 20 ounces; which clears out a slight yellow stain left by the toner, and are finally washed in water for twenty minutes or so. The ammonia bath may be omitted, but in this case the washing may require to be longer. It is best to use the ammonia bath.

If a little more ammonia (1 or 2 drops) be added to each ounce of the toning bath, the sepia produced will be warmer. This serves as a convenient means of adjusting matters for a particular color. An alternative method for obtaining warmer sepia tones is to prolong the toning action considerably beyond the standard time (5 minutes) without adding extra ammonia, and this is perhaps to be preferred.

Although the makers of thiomolybdate do not recommend it, a bleacher of ferricyanide-bromide, containing also bichromate (the ozobrome solution as sold by the Eastman Kodak Co., will serve), may be used with this toner, and gives a very pleasing brown tone, and a much softer print than that obtained when the standard bleach is used. But the washing between bleaching and "thiomolybdating" (lovely word) must be longer; and, if a really plucky print is wanted, it is best to stick to the standard bleacher.

Thiomolybdate differs from sulphide also in giving a series of good tones when mercury chloride is used as

the bleaching agent. While sulphide (with this bleacher) gives only black tones, thiomolybdate produces rich purplish red-browns. The bleached prints should be given a soak in weak hydrochloric acid and thoroughly washed before toning, otherwise, as usual with mercury processes, it is easy to get disagreeable stains. As a reliable means of producing a series of permanent and distinctive warm tones, thiomolybdate deserves to be as well known here as in Great Britain, where it has been extensively adopted.

Thiostannate Toner

This toner, a thio salt of tin, is not sold under this name, but, as it is a patent of Messrs. Burroughs, Wellcome and Co., it may be presumed that it forms the basis of this "sulphide-toning compound." This note is based on the use of "the compound" in its tabloid form. The toner resembles sulphide very closely in the color produced, but the tone is distinctly a better brown than that of sulphide, whilst the odor of the solution is far less in evidence. The softening effect is about the same as that of sulphide, and prints can do with being a little on the vigorous side, in order to give a plucky toned result, if this is desirable.

Hypo-Alum Toning

This is really a method of direct sulphide toning, slower and less convenient but cheaper than the standard process. In fact, it is about the cheapest toning process there is, so far as cost of chemicals is concerned, and is still much used for commercial work, such as postcards. The prints are developed in the usual way to a little more than the depth correct for a black image. The tone given is a purplish sepia familiar to every photographer in the specimen prints on Eastman Royal bromide paper. The Eastman Company, if not the originators of the process, were the pioneers in demonstrating its usefulness, particularly for papers of cream tint. As regards developers, the old iron or ferrous oxalate developer is recognized as the best for the process, but amidol and hydroquinone are also very suitable. In either case, it is found that it is not the print of perfect black color which gives the best result in the hypo-alum bath; one of brownish tinge, with a touch of green in

it, such as is got by giving a liberal exposure and using plenty of potassium bromide in the developer, gives an image which tones better by this method. Hypo-alum has the tendency to eat out the prints somewhat, and, as this action takes place in the less deep shadows or middle half-tones, a print which is clogged up in these parts comes out best in the end. As the toning solution contains hypo, there would appear to be no need for the prints to be washed longer than a minute or two before toning; but, as also the toning bath, as a rule, has to be hot, it is necessary to pass the prints through an alum bath (1 ounce of alum to 16 ounces of water) for five or ten minutes. Therefore it is well to wash out any soluble silver compounds in the film by about fifteen minutes washing. Omission to do this is probably the cause of complaints that hypo-alumed prints have faded. In place of aluming the prints, they may be dried—either procedure hardens the film. If, however, the precaution be taken to place the print in the cold hypo-alum bath and gradually heat up, the hardening may be dispensed with in the case of most papers.

Preparing the Bath

Proportions are not very vital to this process, but the following due to Dr. Baekelandt are as good as any: Hypo, 2 ounces; alum, 200 grains; water (lukewarm), 10 ounces. The hypo is first dissolved, the alum stirred in small quantities, and the mixture put away for a day or two. It should form a milky liquid, from which a certain amount of deposit will have separated. This must not be filtered off, but the bath used intact. But first it must be ripened by adding to it a few cuttings of ordinary printing-out paper (Solio), or a little silver nitrate solution, 20 to 30 minims of a 10 per cent solution. Unless this is done, the bath, when first used, will greatly reduce the depth of the prints, and will not give usable results until quite a few prints have been treated in it. When once ripened, the bath may be used repeatedly, toning better as it ages. The only danger of pushing its toning powers to the limit is that pointed out by Dr. Baekelandt, namely, that when the bath has accumulated a good deal of silver from the print, such silver is absorbed into and "retained" by the film and cannot

be washed out afterward. The best plan is to replenish the used bath constantly with fresh.

The Toning Process

Used hot, at a temperature of about 110° Fahr., the bath tones in about twenty minutes (bromides); or quicker in the case of Velox and other development papers. It is necessary to guard against over-heating or non-uniform heating of the bath. The best method is to place the dish containing the solution in a larger tray, water in which is kept hot by a gas-burner. Instead of putting prints direct into the hot bath, it is well to start with all cold, and gradually warm up to the above temperature, or to a lesser degree of heat, e. g., 90° Fahr., which gives a better tone, though in a longer time. Indeed, the best results with the process are obtained by a bath used at ordinary temperature (60° Fahr.), though then the times of toning run to twelve, twenty-four or forty-eight hours. But toning, contrary to what one might expect, is remarkably even, if prints be given an occasional turn over. They are kept under the liquid by placing them face down in the bath and laying a sheet of glass on them to insure this.

Red-Chalk Tones

A side issue from the sulphide toning process, which I suppose should be mentioned, though it cannot be said to be of great practical value, is the use of a sulphocyanide gold toning bath on prints which have been sulphide-toned. The gold bath gives a bright red-chalk tone, but unless a strong bath is used the action is slow, so that the process is rather expensive. A suitable formula is: Ammonium sulphocyanide, 20 grains; gold chloride, 2 grains; water, 2 ounces. This method can be used also with prints which have been toned by the hypo-alum method, and though very bright tones may be obtained with it, I do not think the results repay the series of operations through which the print has to pass. The Ferguson copper-toning process will give, with a fraction of the trouble, prints of bright red tone, which are perhaps not quite equal to those by the sulphide-gold method but are very satisfactory, and, as regards permanency, the sulphide-plus gold-toned prints are not a bit better than these toned by the copper process.

Street in York, England
(Maker unknown)

Blazing Sunlight
Louis Fleckenstein

Neither is it equal to the standard sulphide process as regards resistance to air containing fumes from burning gas or other deleterious agents.

Reducing Prints

Tinkering with the print is a practice which cannot be honestly advised; it is usually quicker and cheaper to expose a fresh piece of paper and start again. But, as it has been stated that sulphide-toned prints cannot be reduced, it may be well to point out that such is not the case. A mixture of potassium bichromate and hydrochloric acid will re-bleach the toned print, but the best reducer is that worked out by Harry E. Smith, consisting of copper bromide and sodium bromide. These are dissolved as follows to form a stock solution: Copper bromide, 130 grains; sodium bromide, 2½ ounces; water, 10 ounces. This must be mixed with three times its bulk of water for use, but the stock solution may be kept for any reasonable time. It may be employed both for prints toned with sulphide and for those produced with the odorless thiomolybdate already described. Another effective but less convenient method of dealing with dense prints is to place them in the hypo-alum bath, used hot just as for toning in the way already directed.

Sepia Tones by Re-development

Before taking leave of sepia toning by the sulphide method, mention must be made of the fact that sepia tones—as good as, or even better than, those by sulphide, and no less permanent—may be produced by re-development of bleached prints with a solution restrained with bromide, in the same way as for the production of warm tones direct on lantern-plates. The direct method, in the case of development papers, has been found to be about as unsatisfactory as a process can be; but the re-development process, save for the fact that daylight is needed in it, is a most excellent method and is probably superior to sulphide as regards the regularity of the tones. Mr. Welborne Piper, to whom this application of the re-development method is due, directs the use of a bichromate bleacher in preference, but the ferricyanide-bromide given for the standard method will serve quite well. After bleaching, the prints are well washed and then re-developed up to a

warm tone in a developer such as is commonly used for getting warm tones direct on diapositive plates, e. g.: *A*. Hydroquinone, 160 grains; potass metabisulphite, 90 grains; potass bromide, 20 grains; water to make, 10 ounces. *B*. Ammonia, 880, 1 ounce; ammonium bromide, 1 ounce; water to make, 10 ounces. Equal parts of *A* and *B* are mixed, and the mixture applied to the bleached print in full daylight. The tones obtained by this method vary somewhat (for the same re-developer) according to the bleacher. Ferricyanide-bromide tends to purplish-brown, bichromate to brown, ferricyanide alone to warm brown. The method deserves to be better known and used.

Copper Toning Like uranium, this method has been largely displaced from favor by the sulphide processes. Still, outside of this latter, it is one of the most satisfactory toners, particularly for reddish brown and red tones, and also for just taking the chill off the cold black of a bromide print. The results are permanent, and the depth or intensity of the print is practically the same after toning. No better formulæ than those originally given by Ferguson, to whom the method is due, can be used. Three stock solutions are prepared: *A*. Potass citrate, neutral, 1 ounce; water to make 9 ounces. *B*. Copper sulphate, 1 ounce; water to make, 9 ounces. *C*. Potass ferricyanide, 1 ounce; water, 9 ounces.

To form the toning bath, take: *A*, 6¼ ounces; *B*, 7 drams; *C*, 6 drams, mixing in this order. The object of the citrate solution is to keep the solution clear and free from staining action, which it will do if the *B* and *C* solutions are added to it, and not it to them. The *B* solution will keep indefinitely, but *A* after a time forms a mold (visible in the bottle) and should then be discarded, whilst *C* needs to be stored in the dark, and even then goes off in time.

The print, as in all processes where ferricyanide is used, must be perfectly free from hypo. The toning action is gradual, first giving a warm black, next a brown, then reddish brown, and finally, in about twenty minutes, bright red. About the only trouble which is likely to be met with in this process is pinkiness of the

high-lights, due to general staining of the prints. Increase of the *A* solution (up to double = 12½ ounces) in the formula will prove a preventive. The toned prints must not be given a protracted washing, otherwise the image is weakened in consequence of the action of tap water on the tone. Prints will usually stand fifteen minutes, which is sufficient washing, from ordinary supplies of water. Though for warm tones, the copper process is now outclassed by the sulphide and thiomolybdate methods, and therefore does not merit longer mention here, it is still a very useful process for improving the color of bromide prints, giving a dash of warmth to a print developed to blue-black tone, the times of toning in these cases being only from one-half to one minute. For this occasional use, the copper-toning Burroughs, Wellcome Tabloid and the Agfa preparations are most convenient.

Uranium Toning

At one time the only toning process for bromide prints, this method is now almost discarded. The drawbacks to it are rather numerous. The prints must be absolutely free from hypo, otherwise fearful stains are the result; the prints are intensified as well as toned (the greater the toning action, the more the intensification); and, lastly, the toned print must be both briefly and cautiously washed, to avoid general or patchy weakening of the tone by ordinary tap-water. Add to these disabilities the fact that the majority of uranium-toned prints have not proved permanent, and it is not to be wondered at that the method has fallen out of use. Its inclusion in the present monograph is intended as a deterrent against its use, despite the quite pleasing and characteristic chocolate-color tones which it gives. Still, to give uranium its due, we must record the experience of such careful workers as Mr. Welborne Piper, that the results have proved perfectly permanent in the sense that the tone has improved rather than otherwise with time. Therefore, while space cannot be devoted to the full details of the method, the following points essential to success, and quite disregarded in most of the text-book articles on the process, may be mentioned. Metol or amidol is better than ferrous oxalate, as a developer. A light

print is needed. The fixing must be thorough, say fifteen minutes in hypo, three ounces to the pint. Hypo must be thoroughly removed by an hour's washing in running water, followed by fifteen minutes in: Alum, 2 ounces; citric acid, ¼ ounce; water, 20 ounces; and a further washing for three quarters of an hour in water. The working toning solutions should be very weak, much weaker than advised in the usual formulæ. Convenient stock solutions are: *A*. Uranium acetate, ¼ ounce; water, 25 ounces. *B*. Potass ferricyanide, ¼ ounce; water, 25 ounces. The ferricyanide solutions should be made up at the time of use. These 1 per cent solutions are diluted to give 1 part of each chemical in about 3,000 parts of water; that is, 1 ounce each of *A* and *B* should be diluted with water to form 30 ounces of toner, adding also about 15 to 20 minims of glacial acetic acid per ounce of toning solution. After toning, the print is placed direct in a 1 per cent solution of ammonium sulphocyanide for a minute or so. This clears the whites of any yellow stain; a very short wash in *still* water (several changes) is sufficient. The print should not be washed in running water, as any local current of water on them is apt to produce a mark due to a greater action of the water. Also any drops of water adhering to the print should be blotted off before putting out to dry. With these precautions taken, it is found that the only change which takes place in a uranium-toned print is the appearance of a silvery metallic sheen on the shadows. Rubbing with pure hard vulcanized rubber will remove it, whilst varnishing the print with a celluloid varnish, or the convenient "Agfa" zapon lac will prevent its appearance. Worked on these lines, the uranium process may be called fairly reliable. The question is whether the game is worth the candle.

Blue Tones

For two reasons, it is scarcely good policy to trouble with making up solutions for either blue or green tones. First, the iron salts used must be of absolute purity, and the worker may therefore easily go wrong through no fault of his own; and secondly, for really satisfactory blue or green prints, the use of the carbon process in the facile ozobrome form in which it is now available is

a good deal the better. Having made a perfect bromide or development print of black tone, the work of converting it into a blue or green ozobrome carbon print is both short and practically certain, and there is no need to make great allowance for reduction or increase of intensity as there is when toning. However, I will give a toning method for blue tones which with a little practice yields very good and certain results. The black print must be "quite a little" on the pale side: the blue-toning process also intensifies considerably. The toning solution is: Potass ferricyanide, 90 grains; ferric ammonia citrate (red scales), 45 grains; nitric acid, concentrated, 1 dram fluid 60 minims; water to make 20 ounces.

The action of this solution is to convert part of the silver image into silver ferrocyanide, which latter is immediately acted upon by the iron (ferric) salt to form insoluble Prussian blue. If the bath works too quickly, water may be added to it. There is often a certain amount of yellowish stain in the high-lights, necessitating careful washing to remove it. If, as is often the case, the wash-water contains much lime, the depth of the blue will be reduced as soon as the acid has been washed out of the paper and the alkali of the water commences to act on the blue. Considering the ready-made blue toners to be purchased on the few occasions when their use is advantageous, to say nothing of the convenient and speedy ozobrome and "blue-print" methods, there is no need to enlarge further on the many variations of the above process which have from time to time enjoyed brief periods of notoriety.

Green Tones What has been said above as regards blue tones applies with tenfold force to the making of green-toning preparations. A green tone may be obtained by combining the iron (blue) toner with the uranium, or by toning first with uranium and transferring the toned print to an acid solution of perchloride of iron; say, ferric chloride, 20 grains; hydrochloric acid, 20 minims; water, 20 ounces. Another alternative is to tone first in the iron bath to a full blue and then to immerse in a solution of chromic acid. All these methods involve a considerable degree

of judgment of the extent to which the intensity of the print alters, and not one of them can be called thoroughly practicable. A more reliable method is that in which a solution of vanadium chloride is used in conjunction with ferric chloride as a bleaching agent. The following is a formula, but the preparation is not easy to make on account of the trouble to get a perfect solution of the vanadium, which is a salt requiring hydrochloric acid for its solution: Ferric chloride, 20 grains; oxalic acid, saturated solution, 2½ ounces fluid; vanadium chloride, 40 grains; nitric acid, 2 drams; water to make 10 ounces. When this mixture has been made, add, with constant shaking; potassium ferricyanide, 20 grains; dissolved in water, 10 ounces.

In dissolving the vanadium chloride, it is well to place it in a separate small measure, or, better, thin glass test-tube, add to it a very little strong hydrochloric acid, and warm until it dissolves, afterward diluting with some water and adding the solution to the main bulk in which the chloride and oxalic acid have been dissolved. The correct adjustment of a green toning solution is not an easy matter. The solution is used "neat" or full strength, the prints becoming a brighter green the longer they are toned. It is well to give them, after washing, a brief fixing in an acid hypo bath of strength, viz., hypo, 2 ounces, in water 20 ounces. This almost removes the green tone, which returns as the hypo is washed out.

Platinum Toning

This may be called a minor process; first, because it is not suited to all development gaslight papers; second, because it is rather a tricky process to work, and third because it is costly. It gives a sepia tone, not unlike the best sepia of a platinotype print. In cases where its characteristic effect is wanted in a bromide enlargement, it may be worth the trouble, but, as mercury enters into the formula, the results should not be named in the same class with platinotypes. Those who care to try had best make use of Dr. Heatherley's formula, published some year or two ago in the *Photogram*, viz.: Potass oxalate, ½ ounce; mercuric chloride, 20 grains; potass citrate, 30 grains; citric acid, 60 grains; water (ordi-

nary tap), 3½ ounces. To the above is added immediately before use: Potass chloroplatin*ite*, 3½ grains; hydrochloric acid, 3½ grains; water, 3½ ounces. The mixture tones in about three minutes, the seven ounces of bath sufficing for about seven 8 x 10 prints. After this the platinum commences to be exhausted, the prints show reduction in the toning bath (due to the action of the mercury alone) and the solution requires replenishing with platinum.

Black and Blue-Black Toners

The reader may smile at the suggestion that there should be occasion to use such a heading as this, but let him consider if it is not probably within his own experience that prints have lacked that beauty of black tone which should have been theirs had all gone well in exposure and development. Does it not happen, when a mistake in exposure has been corrected by addition of bromide to the developer in liberal measure, or when a development-paper developer has been over-worked, that while the gradation of the print is good enough, the "color" is rusty to a marked degree, or if not so bad as this, not the good neutral black which is desired?

An old remedy for the rustiness is a toning bath of gold and sulphocyanide, such as is used for printing-out paper of the Solio type, but stronger in gold. A suitable formula is: Gold chloride, 1 grain; ammonium sulphocyanide, 30 grains; water, 4 ounces. Use this strength for a print which has turned out with quite a pronounced brownish tone. For one which is only just off color, the bath should be diluted with an equal volume of water; but it is better still, cheaper and quicker, to use the now well-known chromium intensifier, which is a re-development method. The print is bleached in potass bichromate, 10 grains; hydrochloric acid (strong) 20 minims; water, 1 ounce; washed for a few minutes, until the yellow stain is gone and re-developed in a normal amidol developer as used for bromide paper. Tabloid "Rytol" also answers well as re-developer. This process, which is very quickly carried out, produces scarcely any intensification (owing to the extra proportion of acid which is used), greatly improves the tone, and gives just a touch of brilliance to

the print. Even prints which have been passed as first-class will gain an added quality of "color" by this process. It has the further advantage that it assures the complete removal, or rather destruction, of the hypo in the print. If a blue-black color is wanted, the gold, used strong, is better: but, for beautiful neutral blacks closely rivaling the black of a platinotype print, the re-development method should be adopted.

Multi-Color Toning

Local application of toning solutions to prints has long been a field of experiment which has hitherto proved almost barren. When the technical methods of producing such results have been mastered, there remains the greater task of using them to advantage pictorially. So far as local treatment with the single solution toners (uranium, copper, iron and the like) is concerned, multi-color toning is not at all a practical method. It has been left to a Californian worker, Dr. D'Arcy Power, to devise methods of making two-color toned prints which are fairly easy and allow of artistic effects being obtained. Space will admit only of a brief abstract of the papers which Dr. Power has contributed to the *American Annual* and to *Photo-Era* and *Camera Craft*, but the three methods found best are as follows: 1. *Prints in sepia and bluish-black.*—The parts to be rendered in sepia are gone over with the bleacher for the sulphide process, the print rinsed and the whole treated with sulphide solution. The parts left untouched by the bleacher are unaffected by the sulphide and remain the original black of the print. The gold toning bath is then applied, and gradually tones the black portions to bluish-black and the sepia parts to red-chalk, the process being arrested when a favorable color-contrast has been reached. 2. *Sepia and rich black.*—The whole print is platinum-toned, and parts then touched with an amidol developer, whereby they attain a rich black tone, the final result being quite different from that of No. 1. 3. *Prints in any two colors of ozobrome tissues.*—Parts which we will call *a* in the print are bleached as for sulphide toning, the print well washed and converted into a non-transfer ozobrome, that is, one in which the bromide remains united to the tissue. As the bleached

parts do not act on the tissue, there is no protecting film of pigmented gelatine formed over them. Thus, after the ozobrome has been washed and dried, these areas *a* are re-developed with amidol, again washed and brought into contact with a piece of ozobrome tissue of a different color, the ozobrome being "developed" as before by the non-transfer process. The method amounts to the use of the bleach as a kind of stop-out or resist in the first instance. The amidol developer, as it were, does away with the resist, and allows of the portions left unpigmented at the first contact being filled up by contact with a second and different tissue.

Reducing and Intensifying Bromides

Apart from toning, the bromide worker is often anxious to increase or diminish the intensity of a print which errs in one direction or the other, and, great as are the variety of methods, it is not easy to name any which are perfectly satisfactory. For reducing a print, the universal Farmer's reducer of ferricyanide and hypo is not all that can be wished, since its action is to attack the high-lights and leave the shadows comparatively untouched. While this is a gain if the prints are very flat and muddy, that is, over-exposed as well as over-developed, it does not do for those which are about right as regards gradation, and still less for those which are at all chalky, with none too much detail to boast of in the shadows to start with. If Farmer's is used at all for these latter, it should be used very weak indeed, so that reduction requires fifteen or twenty minutes or more to take effect. A less selective reducer is the (very poisonous) mixture of iodine and cyanide made by adding a few drops of 10 per cent solution of iodine (in spirit) and of potass cyanide (in water) to an ounce or two of water. The proportions are about 30 minims of the former and ten minims of the latter to 2 ounces of water. This will never stain, and it will not give a "measly" appearance to the color of the print, as Farmer's will. But it, too, must be used weak, otherwise detail in the high-lights will suffer more than it should. If allowed to act too long, it will of course wipe out the image entirely.

For an intensifier, there is no better prescription than

the chromium formula already given as a "black-toner" except that the quantity of hydrochloric acid should be one-quarter of that given—5 minims instead of 20 minims. The process can be repeated if the first application does not give enough vigor. This method will give a fine black "color" of image and is quite permanent in its results.

BOOKS

For the literature of these toning processes, if further study is desired, the reader is referred to the papers by R. E. Blake Smith, C. Winthrope Somerville, Harry E. Smith and H. W. Bennett, to be found in *The Photographic Journal*, 1907-8-9; to the comprehensive article by Douglas Carnegie, in *The British Journal of Photography* for August 27, 1909; the interesting papers of Dr. H. D'Arcy Power in *The Amarican Annual of Photography*, 1909, and *Camera Craft*, October 1909, and the following books:

Toning Bromide Prints. By R. E. Blake Smith, 105 pp., 1904, 50 cents. A clear and well-balanced treatise, giving the chemical basis for almost every process advised.

Toning Bromides. By C. Winthrope Somerville, 74 pp., second edition, 1907, 50 cents, describing in full detail the methods worked out by the author.

Notes and Comment

An event of considerable interest and no little importance was the Kinemacolor Exhibition given by Mr. Albert Smith, in the concert hall of the Madison Square Garden, on Saturday evening, December 11. Kinemacolor is a word unknown on this side of the Atlantic. It signifies motion pictures in the colors of nature, as perfected by Mr. Charles Urban and Mr. Albert Smith after many years of experimenting. The program was arranged to demonstrate the wide scope of kinematography to which Kinemacolor is applicable. It comprised a series of flower pictures; boat races and water scenes; a street procession in Constantinople; scenes from life on the river Thames; some remarkable pictures of domestic animals, including an animated encounter between a kitten and a parrot; motor-boat and yacht racing; American and British military scenes; views of the Potomac Falls, showing rainbows in spray; a series of portraits in color, showing costumes and flesh tints; photographs of waves and spray; English harvest scenes, and a series of animal studies made at the London Zoo.

In all these pictures, the colors, motion and illusion of life were given with a fidelity to nature which can only be characterized as remarkable. Light and shade, the most delicate color contrasts, and the elusive atmospheric effects which have so much to do with the charm of color in nature, all lent their aid in this demonstration of the greatest advance made in motion photography up to date. The exhibition is one which should be seen if one would fully appreciate its meaning and significance. We understand that the demonstration was given simply to show what Messrs. Urban and Smith have accomplished, and these gentlemen certainly deserve the greatest praise and credit for their achieve-

ment. Readers who have an opportunity of seeing the Urban-Smith Kinemacolor pictures should not miss the pleasure they give.

Some months ago, mention was made in these pages of an invention of Mr. Eugene Ives called the Tripak, an invention roughly comparable to the well-known Filmpack, but which gives, with a single exposure in the camera and after development, a transparency in natural colors.

This invention is now ready for the market, and those interested should send for the detailed announcement entitled the "Ives Tripak System of Color Photography," which may be had on request from Ives Inventions, 939 Eighth Avenue, New York.

Doubtless the general desire for sepia-tone effects will eventually result in bromide and gaslight papers, which will give these tones direct instead of the usual black and white. As a step in this direction, the latest edition of the "Defender Tipster" (Defender Photo Supply Company, Rochester, N. Y.) gives, with particular detail, a process and developer formula which will give sepia tones direct, i. e., without re-development, with their Special Portrait Argo. This process and formula is the result of much experimenting, and will be found altogether satisfactory by those who seek the much-desired sepia effects. The precise color given with the Defender formula varies according to the timing of the exposure. A print normally timed will give a pleasing olive tone, the sepia tones being obtained by an exposure from five to ten times longer than the normal exposure. The publication of this process makes the "Tipster" still more valuable as a guide to photographic printing, and those who have not seen it will do well to send to the Defender Photo Supply Company for a copy of the last revised edition.

Watson's Antinous Shutter Release is now obtainable in nine styles for every variety of shutter in the market:

Kodak, Automatic, Sector, Koilos, Compound, Wollensak, Ibso, Studio, and all roller-blind shutters. An illustrated circular giving particulars and prices can be had on request from George Murphy, Inc., American agents, New York. This firm has also taken over the American agency for Wynne's Infallible Exposure Meter, which is already widely and favorably known in this country.

Silhouette Photography. In the last number of the "Transactions of the Edinburgh Photographic Society," Mr. Andrew H. Baird, an amateur of long experience, gives an interesting account of the making of silhouette portraits by artificial light at night. We abstract the essential details from his paper. Regarding the apparatus there need be no concern, for every photographer possesses the things necessary. Any form or size of camera will do, by preference I use one with a stand; a white transparent sheet stretched on a skeleton frame, or suspended from the top of an open doorway; and lastly, a magnesium flash lamp, or a piece of magnesium ribbon or any other means of producing a fairly intense white light. My own arrangement is as follows: I work at the top of the house where there are two rooms separated by a landing. In one room I have my source of light —a flash lamp; suspended over the open doorway there is an ordinary, white, semi-transparent blind; at the other side of it from the lamp I place my sitter; and beyond, again, the camera. I now proceed to make an exposure. First of all, I suspend the screen, set up the camera, and then pose the sitter, say 18 to 24 inches from the screen, and at right angles to it. To focus sharply, I place a lighted candle a few inches in front of the face, and, having done so, I remove the candle, insert the dark slide, uncover the plate, and uncap the lens. Having lowered the lights, I discharge, behind the screen, 10 grains of magnesium powder in the flash lamp, or burn a few inches of magnesium ribbon. The distance of the illuminant from the screen should be approximately four feet. Let us now consider what has taken place. All the light being on the further side of the sitter, that

next the camera has been thrown into perfect shadow; and so, when the exposed plate is developed, we shall find that no detail of the sitter will show, while the white screen will develop up black. When a print is made, the opposite is the result, —the sitter is black and the surrounding sheet white.

A slow plate is best, and, by preference, a backed one. I focus with full aperture and then stop down to f.11. Should you elect to make a landing your studio, then place the sitter so that the face is not too near a wall; else there will be reflected a sufficiency of light to give undesirable detail on the profile. I find it an advantage to suspend a piece of black non-reflecting cloth on the wall just opposite the face of the sitter, but this is not necessary if there be plenty of space between the sitter and the wall. Should there be a tendency during development to produce detail on the shadow, then stop procedure, rinse and fix. You may intensify, if necessary, but, if the plate is correctly exposed and developed, there should be no occasion for intensification or fakement of any kind.

Photographic silhouettes can also be easily made by daylight. Proceed by placing the sitter against the window, over which is placed a piece of waxed or fine tissue paper. The paper acts as a diffusion screen, and the portion of the window not required should be screened off by blinds or otherwise blocked out.

A new sixty-four page manual on "Developers and Development," dealing with the use of Hauff's developers, has just been issued by the American agent for the Hauff products: G. Gennert, New York and Chicago. It contains the official formulæ and a great deal of useful information about normal, time and stand development, and is a little book which every reader of THE PHOTO-MINIATURE should have at hand for reference.

The Multi-Speed Shutter Company, makers of the well-known Multi-Speed shutter, has been reorganized,

and is beginning an active campaign which will result in making this remarkable shutter more widely known. The factory and offices of the concern have been removed to 161 West 24th Street, New York, where readers interested in the possibilities of a between-the-lens shutter for high-speed work should call, when in New York. The Multi-Speed Shutter goes so far beyond all other lens shutters in capacity that it is best appreciated by demonstration. Seeing is believing, and the collection of prints shown by the Multi-Speed Shutter Company, at their new offices, will satisfy the most captious critic.

By an error in the types in our last number, the size of the picture produced by the 1A Graflex, which uses the regular 1A Kodak film, was given as 2 1/2 x 4 1/2 inches. This should be corrected to read 2 1/2 x 4 1/4 inches. We have seen some very interesting examples of the work produced by this beautiful little pocket camera, and are not at all surprised to hear that it has proved one of the most popular of the Graflex series.

The many-sided advantages and possibilities of the convertible lens are not so widely appreciated as they deserve to be, possibly because of a lack of information about this particular class of lenses. Briefly, a convertible lens is usually a combination of two perfectly corrected lenses of different focal lengths to form an objective of definite focal length. As each of the elements in a convertible anastigmat can be used separately, it is obvious that such a lens really comprises three lenses in one, each having a different focal length, and therefore giving images differing in size when any object is photographed from any given point. If there be any reader of THE PHOTO-MINIATURE not fully acquainted with the practical advantages of having three different focal lengths available in one instrument, we suggest that he write to the Gundlach-Manhattan Optical Company, Rochester, N. Y., for particulars of the Turner-Reich Convertible Anastigmat f/6.8.

One of the simplest and most reliable sepia-toning solutions in the market today is the Barnet Sepia Toner, which gives an absolutely permanent sepia tone with any bromide or gaslight paper. The operations are carried on in daylight and take only two or three minutes for completion. Prints may be toned as soon as made or at any convenient time afterward. For information about this Barnet Sepia Toner and also the Leto Color Toners, producing red and brown, green and blue tones on bromide and gaslight papers and lantern slides, apply for the circular of particulars to the American agent, J. L. Lewis, 379 Sixth Avenue, New York.

A good acid-fixing bath which will do its work cleanly and well and retain its strength for a considerable time is not an easy thing to make up. For many years we have adhered in our negative making to the old reliable formula for the acid-fixing bath given by the late John Carbutt. Latterly, however, we have used the Agfa Rapid-Fixing Salt, and take pleasure in putting on record here our complete satisfaction with this product. Like all the Agfa specialties, it has quality behind it and is absolutely certain in its work, giving complete fixation in a much shorter time than the old Carbutt formula.

The American market is so well supplied with thoroughly good and dependable dry plates that a new manufacturer might well be excused for any hesitation in entering this field. The advent of the Vulcan Dry Plate, made by the Defender Photo Supply Company, is therefore an event worthy of note. The Vulcan is manufactured to compete with any plate in the market and to win success, on its motto, "One Speed, One Price and One Quality," its introduction coming only after many months of very practical experiment and trial. Our personal experience with the Vulcan tells us that it is sufficiently speedy even for instantaneous work on dull days, and that in quality it is not surpassed by any plate within our knowledge. We recommend it as well worthy of a trial.

"The Eurynar" and "Imagonal," two anastigmats made by G. Rodenstock, of Munchen, justly celebrated in Europe because of their excellent qualities, are now available for American photographers through the American agents, James Frank & Son, Augusta, Georgia, and are placed on the American market at very reasonable prices, lower than are asked for other European anastigmats very similar in construction. Those who seek an anastigmat of reputable quality at an easier price than the cost of the better-known lenses of this class should see the catalogue issued by Messrs. Frank & Son, which gives full particulars of these new introductions. We have seen examples of the work of the Eurynar and Imagonal, and judged by these results that they do not fall short in any particular. We understand that the lenses can be had on seven days' trial by depositing the price of any lens desired with the agents.

Readers of THE PHOTO-MINIATURE who use Goerz lenses should be particularly interested in the advertisement of the Goerz American Optical Co. in this issue, offering cash for negatives made with Goerz lenses. Read the advertisement.

Mr. H. Snowden Ward, the well-known authority in photography, author, editor and lecturer, will arrive in New York, January 10, and will at once begin an extensive tour of the principal American and Canadian cities with his remarkable lecture demonstration: "The Marvels of Photography." Secretaries of photographic societies, and others interested in securing a remarkably interesting feature for their list of winter entertainments, should address Mr. Ward, in care of this magazine, 122 East 25th Street, New York City.

The necessity of using reliable brands of sodium carbonate and sodium sulphite in making up pyro-soda and other developers is doubtless fully appreciated by our readers. But, where many different brands are

offered with extravagant claims as to their quality, the average buyer is apt to be confused. The simple solution of this difficulty is to insist on Cramer's Pure Carbonate and Sulphite, which have years of practical test behind them and the guarantee of a reliable house.

A new tank developer, especially recommended for under-exposed negatives, is as follows: Edinol, 9 grains; sodium sulphite (cryst.), 18 grains; caustic potash, 45 grains; water, 20 ounces. The normal time of development, at 65° Fahr., is twenty-five minutes, and the solution may be used repeatedly. It is said to give vigorous negatives with unusual clearness in the details.

An exhibition of photographs connected with the study of landscape gardening was held recently at Wilder Hall (Massachusetts Agricultural College), Amherst. Some capital work was shown by Messrs. W. T. Knox, New York City; C. F. Clarke, Springfield, Mass.; R. W. Taft, Burlington, Vt.; J. Will Palmer, Nashua, N. H.; Chas. Vandervelde, Grand Rapids, Mich.; R. E. Schouler, North Adams; J. Horace McFarland, Harrisburg; Henry Hall, Brooklyn; Dwight A. Davis, Worcester; F. A. Waugh, Amherst; and W. H. Zerbe, Richmond Hill. The following question sheet shows how the exhibition was utilized by the students of the Department of Landscape Gardening, of which Mr. F. A. Waugh is the chief.

The Collection in General.—1. How much material is usually selected for a picture? How does the amount of material affect the pictorial result? 2. What definite expedients are adopted to secure unity? 3. What is done for the sake of variety? 4. Are any definite schemes of composition preferred? 5. What materials are preferred, as trees, brooks, hills, etc.? 6. What attention is paid to sky lines? 7. How are trees treated with respect to grouping, distance, etc.? 8. What consideration is given to atmosphere? In how many pictures is the condition of the atmosphere or weather distinctly rendered? 9. How many pictures are sharp, clear and realistic?

How many are more or less impressionistic? What are the advantages of each method? 10. How many of the compositions shown would it be practicable to reproduce in park construction? 11. Classify the compositions as natural, picturesque and formal. How many in each class?

Regarding Individual Artists.—1. Characterize the work of each artist. Mention the individualities of each, especially the strong points. 2. Point out individual peculiarities in (*a*) choice of materials; (*b*) method of composition; (*c*) method of treatment, as realistic, poetic, etc; (*d*) photographic methods and processes. 3. Do the artists seem to be affected by their landscape surroundings? Is there any local geography apparent in the individual collections? 4. Whose work do you personally prefer? Why? 5. Which do you consider best and second-best pictures in the entire collection?

Books and Prints

All books noticed in these pages may be obtained from the publishers of THE PHOTO-MINIATURE, and will be promptly forwarded, postpaid, to any address on receipt of the publishers' prices as here quoted.

The British Journal of Photography Almanac, 1910, edited by George E. Brown, F. I. C., 1320 pages: paper covers 50 cents, postage 25 cents extra; cloth $1.00, postage 35 cents extra. American agents, George Murphy, Inc., 57 East 9th Street, New York.

In general arrangement this old favorite "Annual" does not differ from its predecessors of the past two or three years, except that the section headed "Epitome of Progress" is perhaps more fully detailed and systematic in its treatment of the various subjects which it covers. The editorial review of the apparatus and processes of the past twelve months is also more comprehensive than in past years, although we do not discover many novelties which have not been previously published. As a reference book to the photographic activities of 1909, covering items of progress, apparatus, processes and methods, manufacturers' and general formulæ, tables and the like, "The B. J. Almanac, 1910" is, without a doubt, the indispensable book of the year, and as such should find a place in the library of every man or woman following photography, whether as a business or as a hobby. We cannot forbear adding a cordial word of praise for the patient and painstaking work of the editor, Mr. George E. Brown.

An Atlas of Absorption Spectra, by C. E. Kenneth Mees, D. Sc., 74 pages, $2.00; Longmans, Green & Co., New York and London.

This Atlas, which, with the exception of a few introductory pages dealing with materials and apparatus, gives engraved reproductions of 170 spectra of as many dyes, and 76 reproductions showing the absorptions of as many filters, was prepared by the Research Laboratory of Wratten & Wainwright, Ltd., Croydon, Surrey, England, under the direction of Dr. Mees. It is undoubtedly the most comprehensive work of its class available for photographic students, supplementing the Atlas of Uhler and Wood, published by the Carnegie Institute, of Washington, which dealt more especially with absorption and the ultra-violet; while this work pays special attention to the red and infra-red portions of the spectrum, not included in the survey made by Uhler and Wood. It was prepared as an aid to Messrs. Wratten & Wainwright in the selection of dyes in the manufacture of their extensive series of color filters. When the work was finished, it was thought that its publication might be useful. The plates are preceded by an Index of Dyes, giving the names, strength, source and stability to light of the 170 dyes dealt with, which is followed by an index of the 76 filters shown in the second section of the plates.

So much for the "Atlas." The second section, dealing with "Wratten's Light Filters," has been separately published by Messrs. Wratten & Wainwright in pamphlet form, for the benefit of photographers, process and scientific workers, for whom these filters are especially prepared. This pamphlet can be had direct from Messrs. Wratten & Wainwright, on request, accompanied by 6d., or 15 cents in stamps.

Penrose's Pictorial Annual, 1909–10, otherwise known as "Penrose's Process Yearbook," edited by William Gamble, is announced to be ready for delivery before the end of the year. This work, which is indispensable to process engravers, designers, illustrators and printers of the better sort, may be described as an annual review of the progress of graphic arts. It is a bulky volume, made up of about sixty articles by prominent workers in the process world, dealing with almost every

phase of process reproduction, from the making of negatives to the finishing of three and four color blocks. These articles are supplemented by about 200 examples of almost every known reproduction process at present in use, printed from blocks supplied by the leading engraving houses of Europe and America. Price $2.50, postfree. Tennant and Ward, New York.

By the time these pages reach the reader, *The American Annual of Photography, 1910*, will be ready for delivery. In the quality of its papers and in the interest of its illustrations, we may fairly venture the opinion that it is better, more useful and more attractive than any of its twenty-three predecessors. Among the contributors to the text we may mention G. T. Harris, F, R. P. S., Thomas Manly, F. R, P. S., Richard Trotter Jeffcott, C. E. Kenneth Mees, H. M. Lomas, F. R. G. S., John Beeby, Chas. S. Taylor, J. A, Anderson, William Findley, Robert W. Tebbs, E. G. Boon, Edgar Clifton, A. Leckett, J. Dudley Johnston, W. H. Zerbe, W. I. Farthing, Charles E. Fairman, Frank E. Huson, Walter Burke, F. R. P. S., J. Arthur H. Hatt, Henry F. Raess, J. W. Little, Wilson A. Bentley, Malcolm Dean Miller, M. D., Henry Troth, John Chislett, Maximilian Toch, R. E. M. Bain, and many others equally well known as workers of repute. That these writers say something worth a careful reading goes without the saying.

To attempt to list the subjects of the illustrations or the name of the picture makers would take more space than we can here give; but the reader may take it for granted that there are very few pictorialists of note here or abroad whose work is not represented. Finally, the volume is carefully and beautifully printed, so that one can enjoy the pictures, with which comment, as brief as we can make it, the new "American Annual" is cordially recommended to all to whom these presents come. Paper covers, price 75 cents; postage 15 cents. Cloth bound, $1.25; postage 20 cents. Trade agents, George Murphy, Inc., 57 East 9th Street, New York.

Night Witchery
By Osborne I. Yellott

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Night Photography

"O divine darkness!" exclaims the Areopagite, surrendering himself to the indescribable loveliness of that ever-recurring mystery which we call Night. "Who maketh the darkness His hiding place," and there "dwelleth in light inaccessible," says the Apostle, trying to put into words the unimaginable beauty of the Lord, and so, down through the years, have men written in high praise of Night, to our own Longfellow, who sings:

> "I heard the trailing garments of the Night
> Sweep through her marble halls;
> I saw her sable skirts all fringed with Light
> From the celestial walls."

Highfalutin? Not a bit of it! Sober truth, as near as words can bring to us the mystic glamor of the nighttime, when, as Whistler tells us, "factory chimneys become campanili, the city hangs in the heavens, and fairyland opens before us." But why drag Holy Writ and poetry in here, of all places? Simply because we are going to learn something of the possibilities of picturing the world of night, and may as well realize in the begining of the adventure that, with or without a camera, we will get out of the night what we put into it—and nothing more. Let us, therefore, set about it with a right spirit and in the right way; so shall our questing be as interesting as it is sure to be profitable. In the end, if all goes well, the reader with his or her first camera, as well as the expert with his years behind him, will know,

in part at least, what pleasures may be gleaned in the magical fields of after-dusk.

Some Possibilities

Eight years have passed since we first discussed night photography in these pages. The little book was widely appreciated, but has long been out of print, which, of itself, justifies a re-consideration of the subject. Apart from this, the years have been fruitful of progress, and

The Long Lane
By H. E. Powell Higgins

we have learned many things which should help us here. In those earlier days, photographing at night was largely a matter of street lamps and pyrotechnic displays. The range of pictorial possibilities is now seen to be wider than we dreamed, and the night photographer finds his subjects wherever his fancy leads him: Along the country road—a sweep of soft gray bordered with looming, undefined tree masses in black; at the entrance to a friendly glade or on the edge of a wood, with a few silver birches to lead the eye into the deepening shadows; along the river's edge with, it may be, a roughly-fash-

ioned boat-landing, a bridge abutment or a group of boats to relieve the softly luminous sheen of water; in the city parks, with the glow of summer dusk along the paths, or the gleam of crystal-sheathed trees in winter-time; the quiet ways of a country town with its familiar lights and slumbrous atmospheric effects at 10 P.M.; the streets of a great city with their unnumbered lamps, or the far-flung illuminations marking the celebration of an historic event, and so on. I have but briefly indicated a few of the newly discovered opportunities, leaving the quiet moonlight and mad carnival to speak for themselves. Latterly too, we have had "snapshots" at night, giving the life of London streets (H. Wild, in *Photography*, 1909); remarkable records of baseball at night, with the game in full swing (*Scientific American*, 1909); and automobile racing at midnight, instantaneous photographs of horses leaping, and the like (W. H. Wallace, 1910). So much for the field of out-of-doors at night. Indoors, too, the night has its pictorial opportunities, although here the work bespeaks some skill and a large patience, inclining the average man to the use of flashlights—with which we are not concerned in these pages.

The point of all this is that, save for purely technical work for record purposes, we should now seek to get the charm of the night-time in our after-dark subjects, rather than the mere photographing of brilliantly lighted scenes or night incidents, the novelty of which quickly passes. Briefly outlined, the purpose of the monograph is to answer the questions, What can we photograph at night, leaving flashlight and astronomical photography wholly outside our view? And how shall we go about the work to get results which will repay us for the time and effort involved?

Times and Seasons

We are the slaves of tradition, and so, for most of us, photographing at night seems to call for rain and snow, with their attendant discomforts, or the semi-occasional public celebration, when the town is "lighted up." This is a mistaken notion. Broadly speaking, we can photograph whatever we can see—by night as well as by day,—so that the times and seasons for night photog-

raphy are governed by our own convenience plus the ability of the night to give us what we seek. There is a lot in the latter half of the foregoing sentence!

Some subjects are at their best in summertime; others need the magic transformation of the snow. In the city streets, a shower will often lend enchantment to the view, and the stretch of country road may sometimes be vastly helped by the pale moonlight. The argument applies with equal force to the time of night and the kind of night best adapted for photographic work. It is quite unnecessary to wait until after 9 P. M. on the darkest of dark nights, unless we seek to portray the "terrors of inky darkness." There are charming night effects in city and country just after dusk and before the actual fall of night. And we can usually trust to the shortcomings of our plates and printing processes, or our lack of skill in exposure, to add something more of the night to our pictures. Then again, observation will tell us that the nights differ "as one star from another" in the vital detail of darkness, and the photographic possibilities of any given subject will change materially with this changing condition. Especially is this noteworthy in the tonal relation of the sky to the landscape a point which too often escapes attention, but which is of importance in pictorial photography at night.

It will, of course, be understood that, in thus broadening the range of photographic possibilities at night, we are leaving behind us the traditional night picture, with its abundant illumination and detail. Those who want the garish night scene, such as we have in most great cities, or the broad expanse of snowy landscape dotted with lamps, or the after-dinner party on the embankment electrically lighted, will naturally choose the time when the lighting conditions are most favorable. On the other hand, those who love the night for its own sake, and who want the spirit and poetry of night in their pictures, will seek their own time and place, as the effects they desire may come within the range of practicability. From this viewpoint, night photography becomes a field calling for continual observation and study, as serious as that demanded by pictorial photography under ordinary conditions.

Alleged Difficulties

Let us first dispose of the alleged difficulties of night photography. In all picture-making with the camera we need sufficient light to impress the sensitive plate or film; some knowledge of the selection and arrangement of subjects; of exposure and development, and a willingness to consider the peculiarities of the particular subject with which we are engaged. That the technical equipment (apparatus and the like) must be equal to the requirements of the work in hand goes without saying. If the reader will check his capacities by this list of essentials, there need be no fear of any difficulties he will encounter in photographing at night.

Illumination

The question of light or illumination will naturally claim attention first. We are so accustomed to working in the brightest possible light and with short exposures of fractions of seconds that conditions which call for exposures of minutes seem to be impracticable. As a matter of fact, all the night scenes we will care to photograph will have sufficient light to give us a record of what we see—if we can expose the plate for a sufficiently long time so that the feeble light can do its work. The time of exposure will depend upon the amount of illumination available, the character of the subject, and the capacity of the lens in use. This last clause, of course, may put some few subjects beyond the reach of the man who depends on a very slow lens. But we need not worry about such exceptional cases.

Exposures

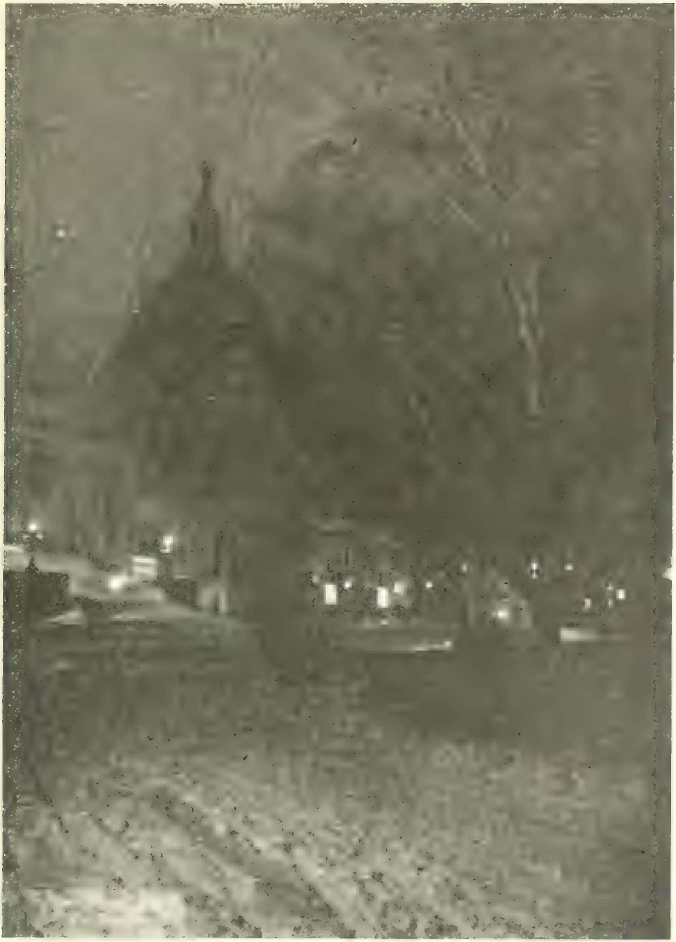
In the determination of exposures at night, we have to face only the difficulties which are encountered whenever we use the camera in an unknown field. A little experience will tell us many things, and we have in these pages the experiences of others in dealing with a wide variety of subjects and conditions. Common sense tells us in the beginning that our night exposures must be very much longer than those given in daylight. But the use of a tripod makes the long exposure as simple as the familiar "snapshot" exposure.

It may happen that, with any given equipment, what is possible at one time may not be practicable at another;

but this will often occur in everyday work, and is not peculiar to night photography. Again, it is probable that we may meet with failure because of errors in exposure, or mistakes in the choice or arrangement of the subject, or lack of care in controlling the position of lights in the field of view. But such mishaps are to be expected in any new branch of work, and can be readily overcome with observation and experience.

What to Aim For Having selected a night subject which appeals by its special interest, or its convenience for the first few experiments, the chief aim of the night worker should be to transfer to his plate the visual impression made by the subject. A careful study of the subject is the first essential. The scale of tones, i.e., the range of tones from light to dark in the subject will usually be short and abrupt. Make a mental note of this scale. As the range of tones is likely to be rendered still more abruptly in the print, every endeavor should be made to get a suggestion of details in the darkest shadows while preserving the brilliancy of the lights. Here we have the only real difficulty in night photography. The tendency is always toward excessive contrast—a further shortening of the limited range of tone gradation in the subject. The solution of the problem depends, first, upon the disposition of the light and dark masses in the field of view; and, second, on correct exposure. In the first, a knowledge of composition will be vastly helpful. We can sometimes better things by a change in the point of view, thus altering the relative positions of lights and darks, getting more light here and a softer shadow mass there—as the subject may indicate. For the second part of the problem we can depend only on experience or the occasional happy chance.

A Correct Exposure Presuming a pleasing arrangement of the lights and darks in a subject, the correct exposure is one which will give the shadows almost clear in the negative, but with faint suggestions of detail, and lights moderate in intensity and as free from halation as is possible or desirable. With such a negative, it is possible to make minor improvements by local intensification and reduction, re-



The Capitol (Washington, D. C.) at Night
Copyright, 1907, by E. L. Crandall

touching, or judicious dodging in printing or enlarging, getting in the end a print which gives us what the eye saw in the scene photographed. As in daylight work, so at night: under-exposure gives harsh and contrasty gradations; over-exposure gives flatness, veil and overmuch distracting detail.

The Pictoral Viewpoint

From the pictorial viewpoint, the shadows in a night scene are of much greater importance than the securing of all the lights which may come within the field of view. In the photograph, because of the protracted exposure, the latter are apt to appear garish and too insistent, giving a "spotty" effect which distracts the eye. If, on the other hand, we can properly render the subtle values of the darker masses, with their wealth of gray and black, we will secure that sense of mystery which is the chief charm of the night scene. This is well exemplified in Mr. Yellott's "Night Witchery" and Mr. Crandall's "Capitol at Night," wherein we have more pleasure in what is only half revealed than in the evident facts. Not always is it possible to secure these pictorial effects in the untouched negative. Circumstances will often forbid more than a courageous attempt. But, if we know how, many pleasing effects can be introduced by double printing (as with gum over platinum), or by first enlarging and retouching, and then reducing to the desired size. Some of the most pleasing night pictures I have seen were obtained by no less than five distinct reproductions of this sort—and the end justified the means. This sort of work, however, is for the advanced amateur, and is mentioned here simply to warn the reader that perfection is not to be attained without labor.

An Example

As an example of how much may be secured in an untouched negative, provided one puts enthusiastic patience into its making, the accompanying night scene by Mr. H. Mortimer-Lamb is given, together with Mr. Lamb's story of how the picture was made. It should be explained that the original print is more pleasing, pictorially, than this much-reduced reproduction.

I quote: One night the winter before last, I arrived home late, somewhere about eleven o'clock; and on my

way I passed a little solitary cottage. A light was shining in a window, and this alone suggested warmth and comfort. The rest was dreary and cold. The full moon shed its clear, blue radiance over a snow-covered earth, a cold wind blew, and one thought of the joy of the tired traveler as he approached this humble abode with the beacon-light shining, a promise of welcome awaiting him.

The Light in the Window
By H. Mortimer-Lamb

So, upon arriving home, I got out my whole-plate camera and fitted it to an old-type Ross single landscape lens of long focus, from which I had removed the original mount made with a view to stopping down the lens and giving fine definition—a much too critical definition for my requirements—and then retraced my steps to the neighborhood of the lone cottage.

After adjusting the camera and focusing on the light in the window, it suddenly occurred to me that, to prop-

erly carry out the idea of my first impression, I should require a model to pose for the figure hurrying homeward. Well, I was quite aware that there would be difficulties in the way of finding any one good-natured enough to leave a comfortable bed to enable me to photograph him at midnight in wintry weather, so there was nothing for it but that I should be my own model. That point once decided, I marked as well as I could the position the figure should occupy to secure a more or less well-balanced arrangement, and then placing my walking-stick so that it stood erect in the snow at that spot, again examined the composition in the ground-glass to make sure that all was as well as possible. I next inserted the plate-holder, removed the slide, and quickly got into position, pulling my slouch hat over my ears and crouching my shoulders to carry out the suggestion of a man who feels acutely the biting frost. As a matter of fact, I entered thoroughly and appreciatively into the part; for the thermometer stood at ten below zero, and, after standing stock still for five minutes, the limit of endurance, there was no mere acting about my pose. Hence I was not a little pleased when the ordeal was over, and half an hour later discovered in the dark-room that I had a printable negative for my pains,—very thin, it is true, but one capable of yielding a print that would convey in a measure my conception of the scene.

Pictorially considered, it is perhaps disappointing, for the figure and the cottage are scarcely connected, and the general effect is, consequently rather "spotty"—one little man, one little house, one little lamp-lit window. But, nevertheless, the experiment succeeded in that I proved to my own satisfaction that, with a lens working at about *f*/6, it is possible to take a satisfactory photograph by direct moonlight, assisted by the reflection of snow on the ground, with an exposure as short as five minutes.

In reference to this particular exposure, here are a few more working details: Plate, Imperial Sovereign (backed); developer, pyro-soda diluted to half strength; printed on Eastman water-developed platinum. Of course, a much more contrasty print might be obtained by using a gaslight paper, such as Velox, but in this

The Houses of Parliament: London
By Paul Martin, 1896

Trafalgar Square: London
By Paul Martin, 1896

The Thames Embankment: Winter
By Paul Martin, 1896

A Wet Night: London
By Paul Martin, 1896

case I did not want more contrast than platinum would give me, and the print justifies my choice.

Outdoor Beginnings

To this preliminary glance at the pictorial side we may profitably add a few words about the beginnings of night photography, and then take up the more technical details, for which the reader is perhaps impatient. The first outdoor night picture of which I find record is a view of the Houses of Parliament, London, exhibited by Mr. W. M. Edmonds, in 1895. In the following year (1896), Mr. Paul Martin aroused widespread interest by his remarkable series of views of London by night, three or four of which, by his courtesy, are included among the illustrations of this number. Since that time, encouraged no doubt by the splendid results achieved by Steichen, Stieglitz, Fraser, Brooks, Wild, Dykes, and others, photographers have given more and more attention to this special field, until we have today a Society of Night Photographers (London, 1909), with good work to its credit.

Indoors

As far as indoor photography at night is concerned (outside of flashlight work), no data is available. I am able, however, to give here a reproduction of the first theatrical scene photographed at night: "The Russian Honeymoon," which was made at midnight of May 1, 1883, at the Madison Square Theatre, New York, by Mr. B. J. Falk, who has kindly loaned me the engraving.

This scene was photographed by the electric light, twenty-four Brush arc-lamps being used, of a nominal power of 2,000 candles each—the globes of ground glass to give the effect of diffused daylight, without the strong, cast shadows supposed to be unavoidable with that kind of illumination. The lens was a Dallmeyer Rapid Rectilinear covering a 10 x 12 plate, and the exposure was six seconds. It was about a year after the making of this picture that Dr. Piffard invented the compound flash-powder, now generally used for theatrical photography at night.

Since this was understood to be an historical event in photography, Mr. Daniel Frohman posed in the picture as one of the two soldiers in the center of the group.

"The Russian Honeymoon"
By B. J. Falk, 1883
See description in text for particulars

Other well-known actors figuring in the scene are Agnes Booth (who died only a few days ago), Estelle Clayton, Frederic Bryton, Mr. LeMoyne and Max Freeman.

The later achievements of Dr. Grun and his liquid lens, *f* 3, in this kind of work are matters of recent record in the photographic journals.

Apparatus The question of apparatus for night photography may be very simply answered in the words: Any camera and any lens. But this will not satisfy the average man, so I add: The better the camera and the quicker the lens, so much the wider will be the range of possibilities and the greater our chances of successful negatives. Supplementing this, it may be said that good night pictures can be had under favorable conditions with the ordinary hand camera and its lens, plus as sturdy a tripod as may be available. The fixed-focus hand camera is advantageous, as it obviates any trouble as to things being in focus. A reflex camera is still better because of its box form and full-size finder, both features peculiarly useful in outdoor work at night. For serious work under all sorts of conditions, a well-built view camera, with square bellows and generous rising front movement, is the ideal equipment. It should be fitted with a level and an accurate focusing scale, as focusing on the ground glass at night is rarely practicable or desirable, except in the case of brilliantly lighted subjects. The use of level and scale is quicker. A strong tripod, easily adjustable and fitted with rubber tips for use on wet pavements should be carried, and a rubber or waterproof cover cloth is indispensable in wet or wintry weather. It should be ample in size and so designed as to be quickly adjusted or removed. Sometimes a piece of candle or a box of wax matches will be a big help in observing the action of the level, the figures on the focusing scale, or in changing the "stops" of the lens.

Lenses For many night subjects the choice of a lens is not an important detail, except in so far as it influences the length of the exposure. In hand-camera work within a reasonable range of subjects, the lens on the camera, whether working at *f* 11 or *f* 8, will be found equal to all requirements.

Some night workers advise the use of *f* 16 for practically all normal subjects, but obviously there is no thought here of work calling for short exposures. For his "snap shots" of London streets at night, Mr. H. Wild uses a Dallmeyer 2 B. portrait lens, with an aperture of *f* 3.3. This permits of exposures of one and two seconds (in some cases of a quarter of one second), thus making possible the recording of moving vehicles and figures in the streets. Mr. Robert Dykes, whose work shows his skill in night photography, seems to use *f* 8 and *f* 11, but advises *f* 11 as best for all-round work. This will sufficiently guide the reader who has any doubts as to his lens being "quick enough" for night work. Whatever lens is used, one is likely to have trouble with "ghosts" or "flare" if any bright light enters the lens from nearby lamps at either side. This is usually caused by internal reflections in the lens, and can be avoided by the use of a lens shade or hood, a cardboard box 4 inches deep by 6 inches wide, or a cone of proportionate dimensions, which can be readily constructed. This should be fitted to the lens so as to hold firmly in windy weather and yet be easily removable when not needed.

As showing the advantage of a high-class lens when a difficult subject is attempted, the view of the Metropolitan Tower, Madison Square, New York (one of the city's sights by night), is interesting. The original print shows the shadow details among the park trees much more plainly than the small reproduction. It was made by Mr. Harold M. Bennett, with a Carl Zeiss Anastigmat IIb No. 4, stopped down, 5 x 7 Seed non-halation ortho plate, pyro tank development, exposure 20 minutes, September 26.

Shutter

The shutter fitted to the lens in use will generally serve all purposes, although there is danger of movement or vibration when an automatic shutter has to be reset during an exposure, as when we close the lens to allow moving vehicles or cars carrying lights to pass the field of view. Many night workers prefer a lens fitted with a cap, or cover the lens with a hat or the hand. A loosely fitting lens cap is certainly safer and simpler than any form of shutter. With reflex cameras there is the danger of vi-

Metropolitan Tower, Madison Square, New York
By Harold M. Bennett
Made with Carl Zeiss, Series IIb, No. 4. Exposure 25 minutes

bration in the use of the focal plane shutter, but this difficulty is obviated by setting the curtain slit at its widest or "open" aperture and using a lens cap.

Plates, Films and Halation In looking over the data published by night photographers, the fact is plain that we can use any kind of plate or film preferred. Non-halation plates are obviously indicated if plates are used, especially if the subject includes bright lights or lamps set closely together as in illuminated buildings. Backed plates serve the same purpose, although the non-halation variety are better adapted to yield soft negatives with the diluted, slow-working developers generally employed for the development of night exposures. Some workers are emphatic in their recommendation of films for the avoiding of halation troubles, but films are not a "sure cure" for this difficulty where powerful electric arcs are included in the view. Others prefer green glass plates coated with ordinary emulsion. Similarly, orthochromatic plates are advised when colored lights comprise the source of illumination.

A Suggestion In considering the bugbear of halation, which looms large in night photography, the reader should not overlook the fact that, for pictorial purposes at least, a certain amount of halation about the brightest lights in a scene may be advantageous rather than otherwise. Apropos of this neglected detail, Mr. Russell Burchall, an English worker with notable examples of night photography to his credit, sends a suggestion worthy of place here.

Although it is perfectly obvious that a satisfactory method of avoiding halation is quite essential before night photography can be said to have progressed very far, it is difficult to understand why workers in this fascinating branch should confine their attention to street lamps. For surely the proportion of the charm of night that can be found in brilliantly lighted streets is very small—nay almost negligible.

When such a delightful writer as Le Gallienne, however, alludes to the lamp-posts in the Strand as "iron lilies," the photographer perhaps has some very slight excuse for making an occasional record. At the same time, the following derisive mock-Kipling lines should

be enough to stay beyond all fear of resurrection any lingering romantic fascination that lamp-posts may possess. The lines to which reference is made run (as nearly as memory serves):

> "They calls your bloomin' lamp-posts 'iron lilies,'
> oh my eyes!
> Why don't they call 'em rhubarb and ha' done?
> An' hansoms, full o' balmy blokes, they say is
> 'dragon flies,'
> Which, I suppose, is just the poet's fun."

Experiments in avoiding those delightful halos that sanctify many photographs of street lamps, are very proper and useful, and have been in many cases, as described elsewhere, eminently successful. While, however, it is the duty of the scientist to prosecute research in this direction, it is the part of the worker with pictorial aspirations to profit by the scientist's teaching, to add to it his quota of artistic impulse and perception, and to show the hidden beauties of Nature—the mystery and beauty of line and mass.

The chief factor of the beauty of night is certainly mystery. If it be desired to preserve this beautiful mystery in pictures, it is necessary to trample mercilessly on any hankering after blobs of light in the shape of street lamps or shop windows. Very few painters have been able to portray night at all pleasantly. Whistler, the greatest of such artists, was "the first to see the exquisite beauty and poetry of a scene from which all garish definition had faded away, leaving nothing but the mystery of twilight or the blackness of night, relieved, perhaps, by spots of golden light. To him the mist was instinct with poetry, and, at the approach of night, all that was material, earthly, circumstantial, dropped away," and yet Whistler never painted anything that, by any stretch of the imagination, could be called a near naked light.

It is more than doubtful, however, whether even yet the blunt majority of the *hoi polloi* has any eyes for that infinitesimal delicatesse of mystery over which Whistlerians are so ecstatic. Consolation, however, may be found in the fact that nothing but good and plenteous

examples of the Whistlerian type of nocturne (for the making of which, peculiarly enough, photography seems eminently suitable) can educate the multitude to a just appreciation of their beauty.

Avoiding Halation

For most outdoor work, however, and especially when enlargement is intended or the making of lantern slides is in view, halation is to be avoided if possible. To this end expert workers advise non-halation (coated, not backed) plates of the highest speed available and the use of rapid lenses, as giving shadow detail with the least possible blurring of the highest lights. Mr. Bennett's Metropolitan Tower view seems to carry out this idea.

The Streets

We can now take up a few different classes of night photography and discuss their handling, beginning with what will generally be the nearest available subject, viz.: streets at night. Here we have two factors to consider: the point of view and widely varying exposures. A great deal of the effectiveness of the picture will depend on a careful choice of viewpoint. The tendency is to include too large an area of thoroughfare. It is better to work from some point which will give us a notable feature of the street as the chief interest in the picture, such as a bold corner, a church or monument, or the large portico of a theater or similar building. Sometimes a street or a side of a public square can be secured through a veil or screen of nearby trees, of which Mr. Alfred Stieglitz gives us an example in his "The Plaza at Central Park and Fifth Avenue, New York." The well-known view of "Columbus Circle at Night," by Mr. W. A. Fraser will also be recalled as a clever example of the use of a monument to add effectiveness to the street view. We may note in passing that Mr. Fraser used non-halation plates, a Ross Symmetrical lens working at *f*/8, and diluted metol developer. Exposures in street work depend on the amount of illumination, and whether the view is an open one or has shadow masses near the camera. In open views, with the lens at *f*/11, the exposure will be from ten to fifteen minutes; when shadow masses or prominent objects are included in the foreground, the exposure should be lengthened and may

Night on Water
By H. H. Brook

The Plaza, 5th Avenue and 59th Street, New York
By Alfred Stieglitz, 1898
Goerz Dagor, No. 2, F.6.8, at full aperture. Exposure, 10 seconds

be from twenty to thirty minutes. So much depends on the illumination of the particular scene and the character or color of the buildings in the view, however, that these exposure figures can only be taken as approximate. Moving traffic that does not carry lights, or moving figures which cross the field of view during such exposures, do not impress the plate and may be disregarded. If vehicles or cars carrying lights come within the view during exposure, the lens should be capped until they have passed or a streak of light across the picture will result.

"Snapshots" Because moving traffic either does not appear on plates exposed at night, or has to be kept out by closing the lens, most night views of city streets have the appearance of a deserted city. The only way to overcome this disadvantage is to attempt street views showing life and movement at night—which brings us to "snap shot" work at night. Broadly speaking, this is possible only in the more brilliantly lighted parts of our larger cities, but Mr. H. Wild has accomplished some wonderful things in this difficult field. I quote from his interesting paper in *Photography and Focus* (March 16, 1909):

For years the fine effect of the electric light and moving traffic in Piccadilly Circus and the adjoining streets fascinated me, and I had a great longing to photograph it, but always felt that a sufficiently long exposure to record the effect of the light on the buildings would result in a mere blur for the traffic, while a short enough exposure to suit the traffic would give nothing worth having on the plate.

In the course of some experiments a short time ago, I found, however, that it was possible to cut down the exposure very considerably, and I thought I would at last have a try at my long-wished-for subject. The results exceeded my anticipations, and, I think, do really give a fair idea of parts of the West End at night. They also show the capabilities of our modern plates and lenses.

One of Mr. Wild's views was taken on an Imperial Special Sensitive plate, with a Dallmeyer 2B portrait lens at f 3.3, and had an exposure of about one second. Another was made on a Wratten and Wainwright Pan-

chromatic plate, and had an exposure of half a second or less. A third was also made on a Panchromatic plate, and in point of exposure this was the most remarkable of the four; as, owing to its being taken just at the height of the theater traffic, it was impossible to give more than a bare quarter of a second. A fourth view aims at a quieter phase of London, but even in this the cabs in the distance made a short exposure necessary. A longer exposure might have helped in this case, but meant sacrificing that little suggestion of life and movement which helps by contrast with the repose of the memorial in the foreground. All the negatives were taken with the same lens and at full aperture.

In these prints there is no sign of reversal, and halation is practically absent, the haze around the lights being no more than could be seen by the eye at the time of the exposure. It was a February evening of drizzling rain, and the light spread a good deal on the mist. That this is so is proved by the fact that the foremost lamps between which and the camera there was comparatively little mist, are quite free from halo.

Another point is the great length of scale rendered, showing what a modern fast plate can do when it is coaxed. I say coaxed, advisedly, for a certain amount of persuasion is necessary to get the most out. In making the exposures, I give as long as the circumstances allow, but at the best we can consider the plate as under-exposed and develop accordingly.

"Coaxing" in Development

These negatives were developed with pyro-metol Imperial standard formula, made up with one part of No. 1, two parts No. 2, and one part of hot water, to bring the temperature of the mixed developer up to about 75°. Dishes, water for rinsing, and fixing bath were all warm, to prevent frilling from sudden change of temperature as much as possible.

I can imagine an old-fashioned photographer holding up his hands in horror at such drastic means of "persuasion," but here again our newer plates show their superiority over their older brethren. Of course, treated in this way, they require most careful handling, as the film is very tender; but if care is taken to avoid any

great difference in the temperatures of the various solutions, and the plate is handled as little as possible, no trouble seems to result, except a slight coarsening of the grain, but so little that even for slide-making it is quite negligible. The original negatives are on quarter-plates, and they enlarge up to 15 by 12 and larger without grain being apparent at the normal viewing distance.

Long Focus Lens

In snapshot work of this kind, continues Mr. Wild, a great deal of watching and waiting is ofttimes necessary. The aim is to get the figures, etc., in the immediate foreground as motionless as possible. As they recede from the camera a little movement is permissible, and at some distance they may be moving quite quickly, always provided they are moving to or from the camera. Objects crossing the field of view should be avoided, if possible. The long focus of the lens (the 2B is about 8½in. focus) is a help in allowing the foreground to be further away and yet a fair size, and, incidentally, enabling the photographer to make himself less conspicuous than when using the shorter-focus lens.

There is a general impression that with a fairly long-focus lens and a very large aperture it is impossible to get sufficient depth of focus. Mr. Wild's pictures show, however, that quite good enough definition for pictorial purposes can be obtained along with as much depth of focus as is necessary. To obtain this, the only point to remember is to see that the nearest object included in the picture is not nearer than half the infinity distance as given in the tables. In other words, the lens should always be set at infinity. The fact that infinity with this particular lens at *f* 3.3 is 200 feet off is, as I have pointed out, rather an advantage than otherwise, as it makes for unobtrusiveness—a quality much to be desired by the after-dark worker in towns.

It, of course, goes without saying that the plates used for this class of work should be well backed. Both the makes mentioned can be obtained ready backed with an excellent black backing, and as one of them the Panchromatic—should be handled in absolute darkness, it is far better to buy them ready backed than attempt the rather risky and messy job of backing them in the dark.

It seems, then, that, given a rapid ortho plate and a lens of an aperture not less than $f/4$, moving figures may successfully be included in any well-lit street scene. True, very rapid shutter exposures are not yet possible after dark, but really we do seem within measurable distance of the time when they will be.

Fireworks Photographing fireworks displays has an attraction for many, and cannot be passed without mention. It is the simplest branch of night work, the fireworks photographing themselves if we put the plate ready and the lens open. I quote Mr. J. H. Crabtree from a recent paper in the *Amateur Photographers:*

Focusing Focus on any fixed lights which may be in the region of the display, and work at full aperture, or not less than $f/8$. It is not necessary that every part of the career of a shooting rocket should be in absolutely sharp definition; in fact, the impressive effect is accentuated very much by the beautiful softness in the more distant lines of fire. Allow one or two lights to fire into the heavens before exposing a plate—look at the focusing screen, and this effect will be evident. We are all aware that a line is "length without breath," but in fireworks lines we want visible breadth and a fair amount of diffusion.

Steer the lens toward the main sphere of the display. "How shall I do that?" you say—a very proper inquiry. We cannot be poking our heads under the focusing cloth in the crowd. I do not use any such fabric. It might be risky at times. And yet we must have the steering correct, as the "let off" is sometimes at one end of the frames and then at the other; and if we steer at the center, we miss *both*, each let-off being outside the lens field. Here is the crux in a nutshell. Before leaving home, take from the kitchen tool-box two small eyeletted picture-screws, preferably of brass, and fix them in the centers of the camera back and the lens mount respectively. You can see them in the dark; the brass will reflect the merest trace of light, and by setting the screw-heads in line with the fire we can, in a moment, make sure of the right direction.

A Flight of Rockets
By Walter Burke, F.R.P.S.

The Lights of the City
By H. H. Brook

Draw the slide, and expose right away.

Exposure Keep the lens open until a fair number of fire lines have shot into the air. Remember the "picture" is to be in the big blank space above the people's heads, and the exposure is not a matter of one, two, or three seconds. The point to consider is this—how much do you want in the "picture"? Do not overload it by any means; but it would be absurd to stop the exposure at "two seconds" when only a couple of rockets have gone up. There would be two lines only on the negative, which would be useless. Watch the display, and keep the lens open until the sky has been well marked with fire. It may take five or ten minutes. The *time* is immaterial.

Now somebody walks right in front of the lens. Do not perturb yourself. Let the people pass and repass. Their effect will be *nil*. During one of my exposures a lady—quite innocently, I am sure—placed an uncommonly handsome picture-hat right in front of the camera, and showed no sign of moving it either to the right or left. This was embarrassing. Just then a fine blare of powder burst on the scene, and I reminded the lady that the camera was photographing. That was quite sufficient. My photograph was assured.

It is just as well to have a friend near by. You will then stand on one side of the tripod, and he on the other. This prevents the crowd kicking the tripod feet in passing. During the actual exposure, it is advisable to keep the camera as still as posssible, to secure the beautiful curvature of the fire-lines. Changing the plate should be performed smartly; firework displays seldom last longer than half an hour, and this time is rather a modicum for a dozen plates.

Have all plate holders numbered *plainly* on the slides. The usual speck of ivorine with a small gray figure is not distinct enough. I paint on my holders, with white enamel, figures quite two inches long. The relief is obvious to the fingers even in the dark. But by striking a wax vesta the number is seen instantly.

The color of fireworks should not be forgotten. I invariably use orthochromatic plates.

A word about developing may be useful here. Un-

less we are careful, we shall get on the negative a zone of dense black deposit, corresponding to the halo of the fire, which will rather spoil realism in the print. To guard against this, my plan is to use a 10 per cent solution of pyro, and a 20 per cent solution of soda. I take 2 drams of the pyro solution, 1 oz. of the soda, and make up to 4 oz. with water for each half-plate. To this I add 1 dram of rodinal. No bromide whatever is used.

By this means all possible detail is evolved, and the whole negative is thoroughly printable on bromide, gaslight, P.O.P., or any other medium.

Parks

In many city parks there are music pavilions, electrically lighted fountains and well-illuminated walks which are worthy of a plate, if the summer night is favorable. Mr. M. J. Ryan, who has done much work in this particular field, tells us that his first care is to select the most attractive viewpoint and to avoid breeze or wind. He uses a Goerz Anastigmat, Series III *f* 7.7, and stops it down to *f* 16, working with non-halation plates. His exposures for illuminated park buildings average ten minutes; for electrically-lighted fountains two minutes with the lens at *f* 11; for a music pavilion with the audience seated under the trees around the pavilion, an exposure of fifteen minutes with lens at *f* 22 gave a successful picture. Landscapes, as we find them in public parks, usually including lighted pathways or lakes with reflections, offer tempting subjects to the night photographer. In summertime it is advisable to take advantage of the twilight, photographing between "sun down" and dark. The exposures will vary according to the character of the scene and the strength of the light, from five to ten minutes being approximate. When the landscape is covered with newly-fallen snow, and the trees are clothed in the crystal glory which a frosty night will give, the illumination will often permit of exposures as short as three minutes, presuming a rapid plate and lens at *f* 11. Nearby lights included in the view should, if possible, be hidden or shielded behind a clump of trees or bushes, and care should be taken to avoid the breaking up of the foreground by heavy shadows.

Coney Island (New York) by Night
Maker Unknown
Made with Goerz Dagor No. 6. Exposure 3 minutes, with lens at $f/16$

Illuminated Buildings

Every World's Fair or Exposition results in an enormous crop of night pictures, and almost invariably the pictures show us just the buildings, with their monotonous display of elaborate designs outlined by thousands of lamps, and generally disfigured by hideous illuminated signs. This is a mistake which the gentle reader should avoid. The pictorial features of a World's Fair at night are not the buildings separately and in detail, but the landscape and waterviews as illuminated by the innumerable lights assembled to decorate the buildings. In such cases the photographer should leave the crowded ways and seek his pictorial impressions of the scene along the less-frequented paths, getting the ornamented glories of this or that building through a screen of foliage or trees. An example of this is seen in "The Plaza," by Mr. Alfred Stieglitz. Such views are possible with a hand camera resting upon a low park seat when a tripod is not available. Many of the best pictures of the St. Louis Exposition were made in this way with a small hand camera, by Mr. George Mellen. In his practice, these small night scenes were afterwards combined to form panoramic views with happy results.

When exposition or other public buildings, brilliantly illuminated, must be photographed, the chief difficulty is the super-abundance of illumination. This tends to over-exposure and the disappearance of all detail between the lamps. By stopping the lens down to *f* 11 or *f* 16 and using a plate of medium rapidity, an exposure of three or four minutes will usually give a correctly exposed negative. The view of "Coney Island by Night," reproduced as one of the pictures in this issue, is a good example of work of this kind, and is particularly good in its general illumination combined with softness and detail. Naturally, the color of the buildings will influence the exposure and, in some cases, may make an ortho plate desirable.

Harbor and Naval Scenes

Night scenes including water, shipping in harbors, naval illuminations, or boat sailing on "flats" or broads when a water carnival is in progress, are always charming. The essentials in such work are a favorable viewpoint,

Searchlight Practice: American Fleet in Sydney Harbor
By J. F. Hurley

The Evening Mail
By J. F. Hurley

shaded from wind or movement, and plenty of patience. The exposure should be ample in order to secure, if possible, a line of demarcation or difference in tone values between sky and water. If the night is not overdark, this is not difficult. For harbor scenes without movement, select that hour when as many distant lights are thrown upon the water as can be had, and give an exposure of fifteen minutes with a rapid plate and lens at *f* 11. For naval manœuvers it is not possible to particularize, but exposures of less than ten minutes are not likely to give pleasing results. If searchlights are in use, the exposures will naturally be regulated by their movement.

Churches

The city or country church will often provide the night photographer with a subject worthy of his skill. In this country our churches are usually more brilliantly lighted within than in Europe, and the stained glass windows are not so heavy in color as in many churches abroad. For this reason, when it is possible, a church should be photographed during a service, so that the lighted windows may strengthen the illusion of the night effect. Orthochromatic plates are advised for this class of work, and an exposure of half an hour, with a lens at *f* 11 will generally be sufficient to give a pleasing negative.

Railroad Yards and Depots

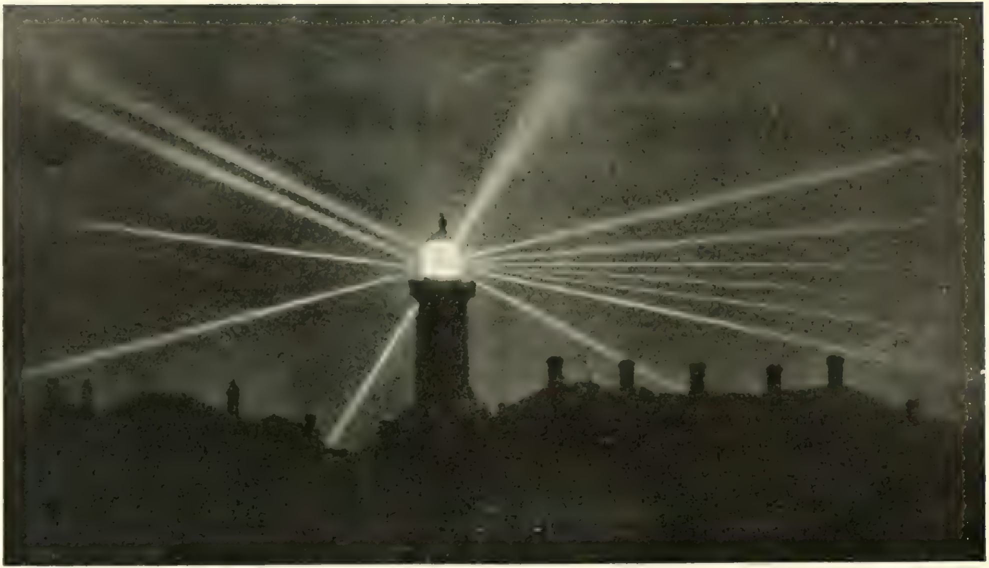
As Mr. J. F. Hurley's "Evening Mail" shows us, many interesting opportunities center about the railroad terminals and yards after dark. Usually there is no lack of light in such subjects, so that the exposures may be shortened and, since sharp definition is likely to prove irritating because of the variety of lines in the average composition, the lens should be used at full aperture to secure whatever softness and diffusion is possible. In railroad yards with the lens at *f* 8, the exposure need not exceed ten minutes; much less if the scene is brilliantly illuminated by powerful arcs. In terminals or depots, the exposure will hardly need to be longer than five minutes, or even three minutes if the lens has an aperture of *f* 6.8. With subjects in this class, patience and ingenuity must be combined to hide or illuminate harsh lights coming into the field of view.

Moonlight Most of the moonlight scenes made with the camera are "sunsets" masquerading under an assumed name. It is however, possible to make photographs by moonlight, but hardly worth while because a fully exposed moonlight scene cannot be distinguished from the same subject as photographed in daylight. Mr. Beeby's "Cathedral Heights" shows the true moonlight effect, being

Cathedral Heights, New York City, by Moonlight
Made by John Beeby, 1898, exposure, 35 minutes. Cooke lens, f/8

identical with a daylight view except for the lighted lamps and an occasional window illuminated from within. Among pseudo-moonlights, Mr. George E. Tingley's "Lux in tenebrae" is one of the best examples I have seen, giving the illusion of night and the spirit of the scene in an admirable way. As a general aid in outdoor illumination the moon is an important factor, and should always be taken advantage of when possible. Thus, at all seasons of the year, but especially in landscape work in winter, many subjects are possible with the aid of moonlight which could not be attempted without it. The use of observation when walking abroad on a moonlight night will demonstrate this.

Lux in Tenebræ
By George E. Tingley



The Lighthouse
By J. F. Hurley

Lighthouses Few readers of these pages are likely to have an opportunity for night photography, such as that we see in Mr. J. F. Hurley's "The Lighthouse." But the interest of the picture warrants its reproduction in this place and an account of its making will add to its interest. According to Mr. Hurley it was a wearisome experiment, as the light is a revolving light. In order to get the rays,

A Lightning Display at 11 P.M.
By W. Atkins

he devised a method of taking a fixed point in the view (one of the chimneys shown), and when this was illuminated by one of the beams an exposure of four seconds was given. Then the lens was covered until the next beam covered the same spot, when a second exposure was made, and so on. This was kept up for four and a half hours during a drizzling rain! As a beam shines on the fixed point once every minute the exposure was equal to eighteen minutes, had the light been a stationary light, which gives the reader a practical point for use when he has a lighthouse in hand.

Lightning Like fireworks, lightning displays are simple subjects for the camera. All that is necessary is to point the camera (at an open window) in the direction of that portion of the sky where lightning is expected to appear, uncap the lens before a forked flash, and let the lightning give its own record. If the flashes are fairly near and vivid, use a stop, say *f* 16 in the lens; if it is distant and faint, work with the open lens. Sheet lightning is useless for photographic purposes, as it either fogs the plate or gives a veiled, under-exposed image of the whole view. A rapid plate, well backed, is advised, and the camera should be focused on any very distant point. Now and again, when we have a favorable viewpoint, the lightning will give us not only a record of the flash, but a pleasing view of the landscape, as in the picture by Mr. W. Atkins reproduced herewith.

Shop-Window Displays This paragraph is given place solely for the professional worker who is likely to purchase the book for the information it gives about photographing shop-window displays—about as difficult a bit of night photography as can be imagined. The difficulty is in the avoiding of reflections, and it is quite impracticable to offer a remedy which will cover all contingencies. An anastigmat of large aperture and a double-coated non-halation plate are advised for this class of work. The lens should be carefully shielded, and, presuming abundant illumination, the exposure in an average instance need not be longer than three to five minutes. To avoid halation and troublesome reflections, see that all lights inside the window are shielded, as far as possible, and that the store itself, behind the window, is darkened during the time of exposure.

In the Home With the rapid plates and lenses now available, the possibilities of home portraiture at night (without the use of flashlights), deserve more attention than they have as yet received. The modern dining-room, with its dark-toned wainscoating or wall hangings, generally illuminated by a central, shaded cluster of electric bulbs or incandescent gas lights, affords conditions altogether favorable

to success. In such a room we have a brilliantly illuminated, although confined, area, within which exposures of from two to six seconds will usually suffice to give good negatives of any subject, such as a figure or group, arranged within the light area. Small groups of two or three persons, sitting around a small table covered with a fair white linen cloth; a single figure reading or at work; children at their school studies, and so on, are subjects which suggest themselves. If the light has a colored shade, the use of color sensitive plates is indicated, and this will materially aid in shortening the exposure and securing shadow detail. Necessarily, an anastigmat lens, with its large aperture, is a decided advantage in this work; but the amateur, with an ordinary hand camera, will find plenty of pictorial possibilities within his reach after the first few experiments.

Development The difficulties which are generally associated with the development of exposures made at night belong to the days of quick development with developing solutions of normal strength. They have disappeared since we began to appreciate the many advantages of tank methods or development with diluted solutions. Given a clean tank, and a pyro-soda developer made up for twenty-five minutes' development, and we are equipped to get the best results from almost all the night exposures worth developing. An exception must be made in snapshot work at night, where the exposures may require special "coaxing," as explained by Mr. Wild on an earlier page. For normal night exposures the formula recommended for the plate in use (i.e., as advised by the maker for tank development) should be given the preference. If this fails, Eastman's pyro-tank developer may be safely used. When the plates seem to lack density after tank development, a final minute or two in a normal developer will usually give the desirable increase of density. Glycin is strongly advised by several workers as ideal for night exposures. Rodinal one part, diluted with 40 parts of water also has its advocates. In the use of Rodinal, care should be taken to push development further than is necessary with pyro, as the image seems to lose in the fixing bath. The ideal night negative is one which has

soft highlights, an absence of harsh contrasts and suggestions of detail even in the deepest shadows.

Fixing, Etc. For the fixing of plates exposed at night, Dykes suggests a stronger fixing bath than that usually employed, as there is more silver to be removed from the film. Thorough fixation is essential and the plate should be carefully shielded from "white light" until it is completely fixed. Twenty minutes should suffice for ordinary plates; for double-coated plates from thirty to forty minutes' fixation is the usual time. In washing, drying and handling night negatives, unusual care should be exercised to prevent markings of any kind on the plate, because of the clearness of the film, which gives even the slightest mark printing value, and will ruin the plate for lantern-slide making. When the negatives are dry, it may be found desirable to locally reduce halation or highlights. This is best done with alcohol, applied with a small leather stump and gentle friction. Contrariwise, much may be done with a stump, pencil or brush to strengthen weak highlights or introduce softness or detail in heavy shadows.

"Artistic Pictures Taken at Night"

An allegorical panel in the "Growlery" of the Strauss Studio, St. Louis. Painted by I. Godlove

Notes and Comment

The patents on the manufacture of metol having expired, the Berlin house of E. Schering is now offering Monomethyl-para-Amidophenol, which is the chemist's nomenclature for metol, under its own registered trade-mark of Satrapol. Needless to say, this new metol (Satrapol) is of the same high standard in quality and purity as Schering's pyrogallic acid and other photographic products.

We are asked to advise our readers that the business formerly conducted under the name of Taylor, Taylor & Hobson, Ltd., St. James Bldg., New York City, will hereafter be continued as the Taylor-Hobson Co. The Cooke anastigmat lens will be imported from the English factory as before, and Mr. J. Ronald Taylor will continue to manage the American business, of which he has had charge since the firm opened its American house.

Burroughs, Wellcome & Co., London and New York, have added to their famous "Tabloid" series a new aid to the photographer in the "Tabloid" Ozobrome Pigmenting Compound, sold by all dealers, in tubes, at 35 cents per tube. The pigmenting solution used by the Ozobrome printer can now be obtained very simply by dissolving one Tabloid product in an ounce of water, and using this as described in the Ozobrome instructions. The formula remains, of course, the property of the Ozobrome Company, while the word "Tabloid" indicates that the actual product is manufactured by Burroughs, Wellcome & Co.

We note that at the recent Alaska-Yukon-Pacific

Exposition, held at Seattle, this well-known house was awarded a Grand Prize for their exhibit of "Tabloid," "Soloid" and "Wellcome" products.

By arrangement with Mr. H. A. Whitfield, the firm of G. Gennert, New York and Chicago, has taken over the sole agency for the Whitfield Spread-Lite Flash Lamps. Mr. Whitfield was the inventor of the system of igniting flash powder by means of a percussion cap, and his patents completely cover the use of this method. The Spred-Lite Flash Lamp has a high reputation among users of flash powders. It is exceedingly convenient in use and can be held in the hand with perfect safety, which enables the user to completely control the direction, height, etc., of the light. It gives a sheet of flame, varying according to the size of the lamp, from twelve to thirty-six inches in width. Several new designs have been added to the series, and, as now offered, there is a Spred-Lite Flash Lamp for a very wide variety of requirements.

Despite the large importations of post-cards made in Europe, the American-made post-card is at last coming to its own, being now preferred by an increasing number of buyers, and especially by those requiring post-cards of American subjects. The National Colortype Company, of Cincinnati, has taken a large part in this good work of bringing the American post-card into successful competition with the foreign cards. They have devoted many years of experiment to hand-colored cards, and can deliver orders for these in two or three weeks, instead of the four to six months required to procure cards from abroad. Readers of THE PHOTO-MINIATURE interested in this line of work can procure samples by mentioning this magazine.

Among the new things of the month worth looking into are Schering's Varitone Tablets for the toning of bromide and gaslight papers and lantern-slides. These

tablets come in tubes, packed in a neat box, with directions for use, at seventy-five cents per box. The outfit comprises all the chemicals needed to produce pleasing green, blue, and a variety of browns, sepias, and Bartolozzi red tones on bromide and gaslight papers, as well as lantern-slides and transparencies. The manipulation of prints with these Varitone Tablets is simplicity itself, no weighing or measuring being required, and the results, as our tests have proved, are completely satisfying. Readers who weary of the eternal black and white of the bromide and gaslight print will find in these Varitone Tablets an easy and certain means of securing a wide variety of tones and colors in their prints. They should prove as useful to the professional portraitist as to the amateur, the tones obtainable being adapted to professional, as well as the various subjects which appeal to the amateur. Varitone Tablets can be obtained through any dealer, or from the manufacturers, Schering & Glatz, 58 Maiden Lane, New York.

If any reader of THE PHOTO-MINIATURE has any doubt whatever about the usefulness or practical interest of the "Complete Self-Instructing Library of Practical Photography," published on subscription by the American Photographic Text Book Co., of Scranton, Pa., we suggest that he send for a copy of the seventy-two-page pamphlet, issued by the above company, which has for its title, "Concerning the Complete Self-Instructing Library of Practical Photography" and which is crowded from one end to the other with extracts from the letters of those who have purchased the library, telling just what they think of their investment.

The Gaumont Company, 124 East 25th Street, New York City, makers of the dainty little Block-Notes, ask us to publish the information that their Canadian headquarters are now at 25 La Patrie Building, Montreal. We are glad to hear that the Block-Note grows in favor in America as it becomes known. It is as clever a bit of camera-making as the heart of man could desire, and its

lightness and daintiness are more than equaled by its remarkable efficiency. Those who are curious to see what a Block-Note looks like, and what it will do, should write for the illustrated catalogue describing the series, which is now ready and will be sent to any address on application.

Despite a heavy snow storm, a large, appreciative audiience gathered at Mendelssohn Hall, New York City, on the evening of January 14th, to hear H. Snowden Ward, F. R. P. S., of London, give his lecture-demonstration, "The Marvels of Photography." The lecturer was enthusiastically received, and the many marvels shown gave evident pleasure to those who braved the storm to see them. Mr. Ward proposes to remain in this country until April, and is under arrangements to deliver the above and other lectures dealing with Dickens, Shakespeare and Chaucer, in many of our eastern "centers of light and learning." He may be addressed at 122 East 25th Street, New York.

The Annual Salon of the Toronto Camera Club will be held April 4 to 9, inclusive. Copies of the prospectus may be had from Mr. Hugh Neilson, 2 Gould street, Toronto, Canada. The exhibition committee will be glad to hear from American pictorialists.

At its meeting, held on January 11 last, the Royal Photographic Society of Great Britain conferred its Progress Medal upon Mr. Alfred Watkins "for his work on exposure and development." Last year the Progress Medal was awarded to Messrs. Lumière for their invention of the Autochrome plate. Previous awards have been made to many of the leading workers in photography, including Mr. F. E. Ives for his work in three-color photography. In 1898 it was awarded to Messrs. Hurter & Driffield for their work in the determination of the speed of plates, and in 1881 to Mr. W. Willis for the platinotype process.

Subject D.—Figures, extra-dark and near to camera. Twice the exposure of standard "strong foreground" subject, C

The figures in this group, reading from left to right, are Alfred Watkins, of exposure meter fame; S. H. Fry, and the late A. Horsley Hinton. Photograph by George E. Brown at the Hereford (1907) British Photographic Convention.

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Correct Exposure How to Calculate It

Correct exposure — the ideal of all photography and photographers — is the key to success, not in negative-making only, but in all branches of photographic work. The act of removing the lens cap, or pressing the pneumatic bulb of the shutter, seems one of such utter simplicity that to devcte a full number of THE PHOTO-MINIATURE to its discussion may seem at first to be wholly unnecessary. But, simple as the operation appears, the factors which underlie exposure are fairly numerous, and have grown in number since the introduction of orthochromatic methods in photography, of diverse shutters and lenses, and of attempts on the part of photographers to deal with subjects which a few years ago would have been considered outside the scope of the camera. Therefore, in writing an essentially practical guide to the correct exposure of the photographic plate or film, the writer must keep in mind more than merely the old academic factors, viz: The aperture of the lens; the sensitiveness of the plate; the strength or intensity of the light; and the character of the subject photographed.

These, naturally, still form the staple features in discussing exposure, but there must also be borne in mind the ability of different types of shutters to give the exposure which has been found necessary; the ability of the plate to "make good" with less time when the rapidity

of movement in the subject compels a very short exposure; as well as the limits, as regards hand-camera photography, which are set by the use of a screened ortho plate. Something must be said, too, as to exposure conditions in photographing scenes by moonlight, or under artificial outdoor lighting, as well as of the precautions which must be observed in exposing from moving vehicles, railway trains, steamboats, and electric cars or omnibuses. So comprehensive is our program that prudence forbids further delay in commencing it.

Three Ways of Finding Exposure

I suppose I can give my reader the credit of knowing that it is the lens which determines the form of the scene or object in a photograph. Exposure determines the correct rendering of the light and shade: It has nothing to do with the form of the object, unless the latter is moving, in which case the exposure must be so short that the amount of movement of the image on the plate is imperceptible. This exposure may not be enough for the proper rendering of the light and shade, but, for the present, we will leave this out of consideration, and confine ourselves to the full exposure of the plate, with the object of producing a negative as perfect as possible as regards rendering of the light and shade in the scene photographed. Really, it is out of place to speak of a "correct" exposure, for most exposures are compromises; and one part of the plate will get too little, while another gets too much.

There are three ways of arriving at, let us say, the "best" exposure:—by instinct, by an "exposure meter," and by an "exposure calculator." The first is undoubtedly the possession of many photographers, who by long practice can "size up" the exposure required, without separately estimating the strength of the light, the speed of the plate or the character of the subject. Obviously, it is useless to waste words over this method, because it is not one which can be taught. With an exposure meter (i.e., an actinometer) we do actually measure the most elusive factor in the case, namely, the strength of the light. Instruments which allow of this being done are the real "exposure meters," as distinguished from the "exposure-calculators" (Method No.

3), which deal with the light question in another way. In a calculator we get figures telling us the actinic power of the unclouded sun at different times of the day and year, and have to judge for ourselves to what extent that light is dulled by clouds or prevented from reaching the subject by foliage, tall buildings, etc.

Advantage of the Meter

So far as allowance for the aperture of the lens and the speed of the plate, the two methods are similar, but the exposure-meter has several great advantages over the tables or calculators. First, it measures the *chemical* action of the light, not the visual effect, which is often different, and then, in any case, the eye is a notoriously bad judge of the different degrees of illumination. It can tell when things are equally illuminated, but it makes big mistakes in judging how different the illumination is in various cases. To quote Professor Silvanus Thompson's concise phrase, "the eye can equate but cannot appraise." It is the meter which does the appraising, and thus renders this method of ascertaining the correct exposure a far more accurate one in interiors, under trees at evening, and in all circumstances where the subject allows of the actual light falling upon it being measured.

A further disadvantage of the calculator, compared with the meter, is that the tables of the former hold true only for a given meridian of the world's latitude. A calculator which is correct for Norway, in latitude 60°, becomes appreciably "out," morning and evening, in Germany or the southern provinces of Canada. The explanation and extent of this disability are the subject of a later paragraph, but it amounts to this, that the worker who familiarizes himself with an exposure-meter can take it with him everywhere and rely upon its guidance, be the place, time or weather what it will.

Before dealing with the practical use of these two methods, we must consider the several effects of two factors which are of equal importance in both systems.

Factor No. 1 Lens Aperture

Of the four chief factors concerned in exposure, namely, lens-aperture, plate, light and subject, the first is the only one which admits of really exact calculation. We can-

not estimate or measure the others nearly so exactly. As the reader no doubt knows, a lens aperture is denoted by the *f* number, that is, the number of times which the diameter of the aperture divides into the focal length of the lens. Thus, a lens of sixteen-inches focal length and two-inch diaphragm is said to have rapidity of *f*/8, or "to work" at *f*/8. The first general rule in exposure is that *the time required varies as the square of the f number.*

Thus, with an *f* number twice another, one must give *four* times the exposure; with one three times another, one must give nine times the exposure. That rule applies in all cases, but it is important to distinguish between the *f* numbers and U. S. diaphragm numbers, because the latter are specially designed to avoid the use of "squared" numbers. Though they get over the difficulty so far as different stops are concerned, we still have to work on the basis of "squares" when the lens is used at an extra focal extension. (See paragraph "Focal Extension and Exposure" below.)

U. S. Numbers

The basis of the U. S. stop is an aperture one fourth the diameter of the focal length, that is *f*/4. This is No. 1 on the "Uniform System." No. 2 is a stop of double the *area*, corresponding therefore with double the exposure, and equaling *f*/5.6. Similarly, No. 4 U. S. is again double the area of No. 2, or double the diameter of No. 1. It is therefore *f*/8. The advantage of the "Uniform System" is that the numbers represent the relative exposures. The method was abandoned in England a few years ago, and is now used only on Kodak and other cameras made in the United States.

The following table gives the *f* numbers equivalent to standard U. S. apertures:

U. S.	1	1¼	2	3	4	8	16	32	64	128	256
F.No.	*f*/4	*f*/4.5	*f*/5.6	*f*/7	*f*/8	*f*/11	*f*/16	*f*/22	*f*/32	*f*/45	*f*/64

With the exception of *f*/4.5, which is inserted here on account of the frequency with which it is now used, each stop in this series calls for twice the exposure with that preceding it.

FIG. 1

Subject A.—Distant (open) landscape. One-quarter exposure of standard "strong foreground" subject, C

FIG. 2

Subject B.—Light-foreground landscape. One-half exposure of standard "strong foreground" subject, C

FIG. 3
Standard subject C.—Landscape with strong foreground

FIG. 4
Standard subject C.—Building or street scene with strong foreground

Diaphragms and Exposures

We have seen that the *f* number is the result of dividing the focal length by the diameter of the aperture. Consequently, if (when using the same lens) either of these quantities is altered, the necessary allowance must be made in the exposure. The reader sees at once that the diameter of his stop varies by opening and closing the lens, but he may wonder how the focal length of a lens can vary. Let us take the latter in a moment. First as regards the stop. It is a geometrical fact that the area of a circle, or disc, varies not in proportion to its diameter, but in proportion to the *square* of its diameter. That is, our diaphragms admit light in proportion to the square of their diameters; but as, in obtaining the *f* numbers we divide the focal length by the diameter only, and not by the *square* thereof, we must take the squares of the *f* numbers as the basis of comparative exposures. As lenses are fitted with diaphragms from *f*/4 to *f*/64, this factor alone amounts to a variation of exposure of from 4 x 4 or 64 x 64=from 1 to 256. In other words, if a subject requires one second exposure at *f*/8, other things remaining the same, it will want one-fourth second at *f*/4 and sixty-four seconds at *f*/64.

Focal Extension and Exposure

Now the other factor in the *f* number, the focal length, may also vary—we are speaking of one and the same lens. When photographing most subjects fairly distant from the camera, the focal extension (i. e., the distance of the lens from the plate) remains the same. This distance is (near enough) the focal length of the lens, and therefore the *f* number marked on the lens-mount, or on the shutter, is the true working aperture of the lens. But when we want to photograph a very near object, we find we have to rack out the lens further, and the *f* number on the lens corresponding with each stop at once ceases to denote the true working aperture. To get the latter, we must divide the actual focal extension by the diameter of each diaphragm. This gives a larger *f* number, and exposure must be given on this basis, that is, in proportion to the squares of the *f* numbers—for our rule holds good here, as always.

We can neglect the effect of this extra extension until we get so near to an object that the image is as big as one-tenth the height of the object. From this point onward, increased exposure becomes necessary, and allowance must be made for it in copying, and in enlarging direct in the camera. As in this work it is usual to keep the same stop in the lens, it is more convenient to allow for the exposure by the focal extension only, the time being proportional to the square of the extension.

Thus, in photographing a large painting from some distance, the lens will be at its normal extension (the focal length) of, say, six inches. When photographing part of the painting, half scale, the focal extension will be nine inches, and the exposure must be increased in the proportion of 6 x 6 : 9 x 9, that is as 36 to 81, or two-and-one-fourth times. Two useful tables for rapidly applying this rule are given on a later page.

Exposures with Half-Lens

So far as concerns exposure, it does not matter how the greater focal length is produced, with the same set of diaphragms, the exposures will go as indicated by the actual working *f* number. This is a point which must be kept in view when using the single components of a doublet lens. In most lenses, the diaphragm markings become quite wrong when the front or the back lens is used alone. Usually, each component is double the focal length of the complete lens, so that each diaphragm number requires to be doubled, i. e., four times the exposure given. Some lenses are made with one component double, and the other one-and-one-half times the focal length. In the case of the latter, exposures will be $1\frac{1}{2} \times 1\frac{1}{2}$ times (twice) those for each stop when using the complete lens. The user of a lens of this unsymmetrical type will find it best to carry a card giving the values of the stops for the whole lens and each separate component. Thus, for a lens of five inches focal length, having single components of ten and seven-and-one-half inches, the values of the stops will be as follows:—

Complete lens . .	*f* 5.6	*f* 8	*f* 11	*f* 16	*f* 22	*f* 32	*f* 45
Ten-inch focus . .	*f* 11	*f* 16	*f* 22	*f* 32	*f* 45	*f* 64	*f* 90
Seven-and-one-half-inch focus .	*f* 8	*f* 11	*f* 16	*f* 22	*f* 32	*f* 45	*f* 64

Slow and Rapid Lenses A good deal of mystification is created by the statements of lens-makers that certain lenses are "extremely rapid." Beginners, I know, wonder whether one lens at, say, *f*/6, is more speedy than another at the same aperture. Actually (in practice) there is no difference. Practically any lens, unless its glasses have become colored with age or have suffered great loss of polish, is as rapid as any other of the same *f* number. Any difference which may exist is due to the greater or less number of glasses (and therefore of reflecting surfaces) in the lens, or to the greater thickness of glass. But when all is said and done, these variations in construction will not account for a difference of more than 20 per cent in the rapidity of the lens at the outside; in other words, six seconds exposure instead of five. The reader will be safe in taking aperture, and aperture only, as the measure of the rapidity of a lens. We should call a lens of *f*/4.5 one of "extreme rapidity," as large an aperture as it is useful to have; one of *f*/5.6 or *f*/6, a "rapid" lens (the most useful aperture for all-round work), and lenses of *f*/8 and under as "slow," and suitable chiefly for time-exposure work, not for hand-camera or instantaneous photography except under favorable conditions.

Factor No. 2 Speed of Plate As regards the second chief factor in exposure, we are much in the same position whichever method we use: "exposure-meter" or "exposure-calculator." The makers of the Watkins and Wynne meters issue tables of plate-speeds at frequent intervals: with "calculators" also, such as the very convenient pattern contained in the "Wellcome Exposure Record," a list of plate-speed numbers is given. In both instances, one requires to make sure that the sensitiveness of the plates to be used does actually answer to a given number on the tables. This is particularly necessary when using plates of extreme rapidity, because it is these which most tax the skill of the plate-maker to keep to standard. Slow and medium-speed plates are much less liable to show discrepancies between the actual speed and that given by the makers of meters and calculators. It is not uncommon to find that the plate-makers' statements as to speed

vary considerably on this same point. One will mark a plate twice as fast as another which is found both in practice and by the meter-makers to be its equal.

Checking Speed Numbers

Therefore, whichever method is being employed, a point should be made of making for oneself a check in the speed-number. Select a subject which corresponds with the "strong foreground" (Figs. 3, 4 or 5) taken as a standard in almost every system of exposure and, having ascertained the exposure required for the speed given in the tables, give one or two exposures on this basis, one or two taking the speed as double, and one or two with speed as half. Develop all together in the developer which you customarily use, and compare results. In making your tests in this way, be sure that the exposures *are* actually the double and half of the standard. It won't do to rely on the markings of most instantaneous shutters for this purpose: better to keep the shutter at the one speed and give the half exposure by using the next smaller stop and the double by the next larger; or, if the exposures ran into a decent number of seconds, say, not less than five, exposing by cap or "time" adjustment. To obtain a really useful test, the scene should be brightly lighted with some cast shadows and a good range of contrast. A few plates exposed in this way before starting a tour would save much later disappointment. It gives the user of a meter the plate-speed number which he personally should use to compensate, not only for any difference between the meter-makers' figure and the plate-makers' actual performance, but also for any tendency on the part of the user to read the tint of the meter-paper too dark or too light. Plate-speed number is the best factor to choose as a species of regulator by which to adjust a meter or calculator to one's own peculiarities — the "personal equation," as the scientific folk have it.

Plate Speed Numbers

In this country photographic manufacturers do not, as a rule, mark their plates with a speed number; they use the terms "Rapid," "Fast," etc., or various fancy names, to indicate degrees of sensitiveness. Many British makers mark by the H & D (Hurter & Driffield) system, though not

FIG. 5
Standard subject C.—Figures at fair distance from camera

FIG. 6
Subject D.—Landscape with extra-dark foreground. Twice the exposure of standard "strong foreground" subject, C

FIG. 7

Subject D.—Building or street scene with extra-dark foreground. Twice the exposure of standard "strong foreground" subject, C

FIG. 8

Subject D.—Figures, extra-dark and near camera. Twice the exposure of standard "strong foreground" subject, C

strictly on the lines laid down by the authors; so that H & D numbers on the boxes of different makers, and not always on those of the same maker, are not comparable. Some few makers mark also the Watkins speed, and one or two also the Wynne; but, as the reader will have gathered from the previous paragraph, whatever figure is taken as the plate speed, it is well to confirm it by one or two practical exposures under test conditions. As a rough guide to speeds, we may give some figures which are not far out in giving an idea of the speeds of the ultra-rapid,* extra-rapid, medium, and slow plates, made by most leading makers.

	Watkins	Wynne	Wellcome	Proportional Exposures
1. Ultra-rapid	250	f/111	1/8	1
2. Extra-rapid	180	f/90	1/6	1½
3. Medium	90	f/64	1/3	3
4. Slow (or landscape) . .	45	f/45	2/3	6

These are round average figures, yet the user may take them as approximations, to be checked by one or two exposures timed by a meter. As it is not usual to use plates slower than No. 4 in our table, it will be seen that, the other conditions remaining the same, exposure according to one's choice of plate ranges from 1 to 6. The opportunity for error when using a plate marked as of the highest, second, third and fourth degree of rapidity by the maker, is of course very much less; for plates of a given alleged speed are not likely to differ from each other more than about 100 per cent.

Exposing by Meter

So far, everything we have said applies with equal force to both meters and calculators, but of the two other factors in affecting exposure,—the light and the subject,—the first is treated quite differently in the two systems, and the second differently in certain cases, so that, to avoid confusion, we must consider them separately. We thus come to this essentially practical part of our subject, the use of an exposure-meter.

The basis of the system, as carried out in both the Watkins and Wynne meters, is actually to measure the chemical or actinic power of the light, immediately

*Mr. Watkins in his latest speed-list give a higher speed than 250 in the case of seven plates only.

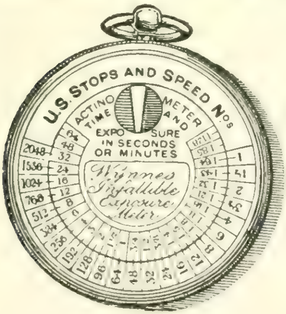
before exposure, by means of a piece of prepared paper having the property of darkening in the light much more quickly than ordinary collodion or other print-out paper. This sensitive paper is placed so that a small portion of it comes against a patch of bluish paper of "standard" tint. The time required for the paper to reach this standard tint is the measure of the actinic power of the light. It is the 'actinometer-time' of the meter. Obviously, it is necessary that we measure the light which falls on the *subject*. The light which falls on the *camera* does not matter. We can put the camera at the back of a veritable black hole of Calcutta, and, so long as the rays reflected from the subject reach the lens, the exposure will be all right. This essential in the use of an exposure-meter cuts both ways. It is easy enough to place the meter in the shadow of a near building when photographing subjects close at hand (the shadow of one's body is a quite satisfactory substitute for that of the actual subject): it is easy to test the actual working light when photographing in woods, under trees or in interiors; but when our subjects are a long way off, when they are open landscapes, or when they are of a specially "light" character (that is free from masses of shadow), it becomes necessary to use our own judgment, and to make allowance for the greater or less amount of light which is *reflected* by the subject to the lens. In this we are aided by certain factors which have been found to hold good in regard to these departures from what we may call the "standard" subject. We will define and illustrate these classes of subjects directly. Meanwhile, let us see how the exposure meter is used in practice, bearing in mind the fact that its indications hold good so long as the light falling on the meter fairly represents the light falling on the subject, but that the indicated exposures need to be increased or decreased when this is not the case, or when the subject is specially light or dark in color.

Watkins' Exposure-Meter

The two meters most commonly in use are the Watkins and the Wynne. Both are employed very similarly, although the construction differs somewhat. In the Watkins most popular form of dial meter known as the

"Bee," which is everywhere available, the outer metal rim of the dial has engraved upon it a scale of plate-speeds up to 500 (equivalent to as rapid an emulsion as is made); and a scale of exposures from 130 seconds (or minutes) to three-fourths, and thence downward as '2, '3, '4, and so on, these numbers (prefixed by an apostrophe) denoting, ½-, ⅓-, ¼-second, and so on. This scale of fractional exposures is continued on, so that the same series of numbers does duty also as plate-speed numbers. On the inner and revolving part of the meter is a scale of actinometer times from

130 to 6 seconds (or minutes), and a scale of diaphragms from f/4 to f/90. Discs of the sensitive paper are held behind this dial, and a fresh portion is brought into position for expossure by turning the back disc of the meter a little. A fresh piece of sensitive paper is brought between two patches of standard tint, one a quarter the depth of the other. The deeper is that which is usually used out-of-doors, and the times obtained with it are those to be used in setting the meter. But, in very dull evening light and in interiors, the use of the full tint may need too long a time, and then it is convenient to expose the paper by the quarter-tint and multiply the time noted by 4.



Wynne Meter

In the Wynne meter, similar full and quarter-tints are provided, but the arrangement of graduated scales is different. Really, there are but two scales, but each serves two purposes. The outer fixed scale is one bearing diaphragm numbers from f/4 to

f 256, the plate speeds being worked out in such a form that this same scale can be used for them. The inner movable scale bears numbers from 64 seconds (or minutes) to one one hundred and twenty-eighth of a second, and serves both for actinometer times and exposures.

Their Differences

In practice, the difference in construction amounts to this: With the Watkins Bee meter, we first set the aperture of the lens opposite the speed of plate we are using. Then, opposite any time which the paper may take to darken to full tint, we see the exposure necessary.

With the Wynne, we set the time required by paper to darken opposite the speed number of the plate in use, and then we see opposite every diaphragm the exposure necessary. Thus, if we are working with the same stop throughout the day, it will be quicker to work with the Watkins than with the Wynne: we shall set the stop number opposite the plate number, and shall not need to move the scale of the meter, but only to look what is the exposure corresponding to a given actinometer number. On the other hand, if we are anxious to use a larger or smaller stop, the Wynne tells us at once what exposure corresponds with each, and allows us to see at a glance whether it is advisable to expose longer with a smaller stop or shorter with a larger one. Very frequently — e. g., when there are moving objects in a picture—it is of the first importance to make exposure short: we shall use the larger stop. In other cases, the nearness of an object may necessitate a smaller stop in order to secure sharpness in all parts of the subject. The "Wynne," at one setting, indicates the correct-exposure time corresponding with each diaphragm.

The Standard Subject

The class of subject which is taken by makers of exposure=meters and tables as the "standard" is one in which prominent objects are fairly near to the camera. It is so taken chiefly because it is the most common. It includes landscapes with a fairly strong foreground, as distinguished from a landscape in which the masses of shadow nearest to the camera are in the middle distance. It includes street scenes, where buildings are not excep-

tionally dark. Figs. 3, 4 and 5 may be taken as typical examples of this "standard," or "strong foreground" subject, in landscape and architecture respectively. Compare it with the examples of the "light foreground" (Fig. 2) and "heavy foreground" (Figs. 6, 7 and 8), and you will see better what is meant by it.

Testing the Light

An old rule—and a good one—in photography is to "expose for the shadows." That means that in using a meter we must measure the light which reaches the shadow of the subject. In the case of our standard subject this will not be a very deep shadow, and it will be found perfectly satisfactory to hold the dial of the meter in the shadow of one's own body, but facing the source (the sun or the sky) from which the light comes. Hold the meter almost at arm's length and with your eyes half-closed. This makes it easier to judge when the paper just matches the tint in depth. It is depth alone which matters; the paper will not always match the tint in color. A fresh section of paper having been shifted into position between the two tints, commence counting seconds until the paper, which is light at the start, is seen to equal the tint. This time is the "actinometer" number of the light. In the shadow of the body in bright summer sunlight, it will be about five to ten seconds. The reader will be safe in taking it that, in the case of subjects such as Figs. 3, 4 and 5, the use of the shade of the body as a substitute for the shadow of the subject will not lead him astray. Yet many subjects present greater depths of shadows, and here the meter should be placed (again facing the source of light) where it will measure the light falling upon this poorly illuminated part of the subject. The avenue of trees in Fig. 6 is an example. To secure fair detail within the shadow of the trees, we cannot disregard the much feebler illumination there: the meter may be held there (not perhaps in the very darkest spot), and the light measured. If the difference proves to be very great compared with the light outside, it will usually be well to give an exposure somewhere between the two; since in an extreme case, such as this, exposure of both is bound to be a compromise. But the meter does actually

tell us where we are. Often, in a case like this, you will think that the meter is telling you to give too much time; but I venture to predict that after development you will agree that the meter was right and you were wrong. If the subject should be one without recesses of shadow whilst the light falls flatly upon it, the right thing to do in getting the actinometer number is to point the meter directly to the light, even sun. But it is rare to meet with such a subject, and such lighting usually gives an unpleasing, flat effect.

The Directions of Lighting

This leads me to disgress a moment, to point out that one great virtue of the meter is that it *makes* us pay attention to the direction in which the light falls on the subject. And this is of equal importance to correct exposure in giving a successful and pleasing result.

As a rule, the lighting most favorable to a good photograph is direct sunlight coming from behind the camera from a point about midway between back and side,—that is to say, from the north-east or the north-west point of the compass, supposing the lens is pointing directly south. The same rule holds good, though in lesser degree, if the sky is more or less clouded; but then the same brilliance of result cannot be expected. With an unclouded sky, the chief beauty of sunshine, that of the shadows, is lost if exposures are made around noon. The best time of the summer day is really before nine o'clock in the morning and after three o'clock in the afternoon. When the sun is higher in the heavens the cast shadows are both short and intense. Two kinds of lighting are especially to be avoided: namely, that in which the sun directly faces the camera, and that in which it is directly behind it. The former (Fig. 10 is an example) turns the shadow side of the subject to the camera and calls for a very greatly increased exposure. The second removes all relief and contrast from the subject, owing to the absence of cast shadows. It calls for much less exposure than the same subject under good lighting. These few simple rules will put the beginner in the way of avoiding failures. If he will make intelligent use of a meter, and follow the rule of turning the meter toward the source of light, it will be

FIG. 9

Subject B. — Landscape with light foreground. Half the exposure of standard "strong foreground" subject, C. With trees in full foliage this subject would fall in Class C or D.

FIG. 10

An example of exposure against the light. Owing to the shadow side of figures being turned toward the camera, a subject lighted in this way requires much more exposure (two or three times) that which would be sufficient were the light coming from behind the camera.

impossible for him not to consider the kind of lighting to which he is subjecting a subject.

Sunshine Effect

The brightness of the lighting of a scene in which the sun is shining will often lead the worker to disregard the fact that a proper rendering of that sunshine effect calls for a good deal more exposure than is necessary when the lighting is more diffused. The bright sun brings to light much detail in the shadows, and to convey the effect of sunshine it is necessary to expose for these shadows. In practice, subjects on which the sun falls direct from one side or the other are difficult to over-expose. The result will then have the soft bright effect of sunshine, instead of the hard detailless shadows which represent the insufficient exposure of the ordinary snap-shot.

Interiors, Etc. by Meter

To return to our meter; the standard rule for using it is to expose the sensitive paper to the light which is actually reaching the deepest shadows which form an important part of the subject. That applies to shadows cast by buildings near at hand, to those under trees, in woods, inside buildings, large and small, and light and dark. In these latter, the time taken by the paper to come to the full tint may be so long that it is better to use the quarter tint, and then to use such a stop in the lens that the time which the paper takes to come to this quarter tint is the actual time of exposure,—that is, expose actinometer and plate at the same time. Mr. Watkins, in his "Exposure Notes," gives the values of these stops for plates of different speeds. One or two of these figures are as follows:

Plate speed . . .	250	180	130	90	65
Stop	*f* 64	*f* 56	*f* 45	*f* 40	*f* 32

That is to say, when using a plate of 180 speed, we shall set the lens at *f* 56, uncap it at the time of commencing the exposure of the meter paper, and cap again when the paper has matched the quarter tint. In very dark interiors, this will still mean a very long exposure, but there is still a further plan of using a sixteenth tint, which is the first perceptible darkening of the paper,

and is seen by turning the meter paper forward a little to bring the exposed against an unexposed piece. With the appropriate stop in the lens, exposure is done when the meter paper begins to show a difference from a bit of it which has not been exposed at all.

Distant Objects

As to distant and very light objects, the indication of the meter at full tint requires to be amended roughly in accordance with the following factors:

Sky and clouds, give $\frac{1}{16}$ exposure found by meter for standard subject (C).

Sea, give $\frac{1}{8}$ exposure found by meter for standard subject.

Open distant landscape (A), give $\frac{1}{4}$ exposure found by meter for standard subject.

Light foreground (B), give $\frac{1}{2}$ exposure found by meter for standard subject.

Extra-dark foreground (D), give twice exposure found by meter for standard subject.

As regards subjects of this last type, D, one can, as already explained, actually test the light in the shadows and give an exposure corresponding with the time there noted, or somewhat less if thought necessary. The alternative course is to take the reading of the meter with the latter in the shadow of the body, and then give twice the time or more if the heaviness of the subject justifies it. One usually settles down to this latter method. It is a matter of choice. Some prefer to select a spot in the shadow for the meter test; others, to judge the subject and give twice or more the exposure.

A fair idea of the character of these subjects will be gathered from the reproductions marked in accordance with the letters used after each and bearing also the factor.

To this I would append one piece of advice, which the reader should write in big letters at the back of his mind.

With *open* subjects, A and B, err in the direction of *under* exposure.

With *heavy* foreground, D, err in the direction of *over*-exposure.

This advice holds good when working both with meters and calculators.

Exposure Calculators The meter, as we have seen, does actually measure the light at the time of exposure. Tables or calculators of exposure go on a different system. They tabulate the actinic values of outdoor light throughout the year and throughout the day under the *assumed condition of a bright sunshine in a cloudless sky*, leaving us to judge how far the atmospheric conditions at the time of making our exposure are better or worse than the assumed conditions, for which the figures are given.

Light Variation It would take us too far from the present subject to enter upon the basis of the daily and yearly variations in the power of sunlight. Suffice it to say that they can be calculated from the altitude of the sun in the sky (the result of the earth's daily rotation on its axis) and the "declination" of the sun, or the angle which the axis of the earth makes with the rays of light from the sun. Each day, as the sun climbs the heaven, the rays become more powerful, owing to the more direct path through our atmosphere which they take up to noon; *vice-versa*, from noon to evening. Assuming that the state of the sky remains the same, the light along latitude 40° (that passing through Philadelphia) will at early morning or late afternoon be about 1/8 that at noon. The noon light of an unclouded sky on a given latitude varies with the seasons. Taking 1 as the value in summer (May-June-July), the power in spring and fall (March and April, August and September) is about 3/4, and that in winter (November, December, January, February) about 1/2. This is a rough approximation which shows that, so far as the motion of the earth is concerned, the variation in the power of the light in the year is from about 1 to 16.

Supposing that the figures obtained on this basis are correctly tabulated, the allowance that we still have to make for the variation of the light from sun to gloom represents probably a range of 1 to 5; so that, if we make a mistake between two successive degrees, we shall still not be far out. This range, of course, applies strictly to subjects where the light falls unobstructed. In subjects such as streets, buildings, avenues and woodlands, a further extra allowance must be made in

accordance with the indications of a subject table, aided by the worker's own judgment. It is with such badly lighted subjects as views under trees, interiors, that the meter excels the calculator; the latter in these circumstances is little more than a rough aid to guesswork.

All these things—hour of day, season, state of the sky, and situation of subject as regards access of light—are lumped together in the time which the meter paper takes to darken; in working by calculator we must take them one by one and make separate allowance. Nevertheless, calculators in conjunction with tables allow of this being very quickly done,—if anything, a little more quickly than taking a reading of the meter-paper.

Tables of Daylight

Probably the most accurate tables of the value of daylight at different hours of the day and times of the year are those given by Mr. Gaston M. Alves in THE PHOTO-MINIATURE No. 54 (Now out of print.—Editor). They differ from most of their kind in splitting both the year and the day into a greater number of divisions, each corresponding with an equal change in the light intensity. Thus, they are more accurate (than the usual tables) for exposures early and late in the day. Like other tables, they give the intensity of direct sunlight (or rather the exposures with various diaphragms corresponding with such intensities and a given plate), and, as is the case with other tables, the numbers given require to be multiplied by a factor, depending on the state of the atmosphere, when photographing subjects on which the light falls unobstructed from the sky; and, still again by a factor, if the subject is further shielded from the light, e. g., is under trees, between tall buildings or inside buildings. In all such cases as this, a figure for the value of the outside light is a crude guide to the exposure, and though the photographer can be given some useful indication of the relatively much larger exposure which such subjects require, he is still left to rely very largely on his own judgment. In view of this fact, there is no doubt that a more approximate table than those of Mr. Alves may be taken. Most of these are based on the figures of Dr. Scott worked out for the Ilford Company, and used in conjunction with

TABLE (A) OF DAILY AND YEARLY VARIATION OF DAYLIGHT ABOUT NORTH LATITUDE 40, NORTHERN UNITED STATES

A.M.	11	10	9	8	7	6	5
P.M.	1	2	3	4	5	6	7
May . . . . June . . . . July	1	1	1	1½	2	3	4
March . . . . . . April . . . . . . August . . . . . . September . . .	1	1½	2	3	6	..	..
February . . . . . October	1½	2	3	6	..	..	..
January . . . . . November . . . December	1½	2	4	..	..	..	.

TABLE (B) OF DAILY AND YEARLY VARIATIONS OF DAYLIGHT ABOUT NORTH LATITUDE 30, SOUTHERN UNITED STATES

A.M.	11	10	9	8	7	6	5
P.M.	1	2	3	4	5	6	7
May . . . . June . . . . July	1	1	1	1½	2	6	..
March . . . . . . April . . . . . . August . . . . . . September . . .	1	1	1	2	3	..	..
February . . . . . October	1	1	1½	2	6	..	..
January . . . . . November . . . December . . .	1½	1½	2	4	..	.	..

the circular calculator issued for Ilford plates. A further simplification of Dr. Scott's tables, applying to the northern and southern portions of the United States, is given below: The strongest light from 11 A.M. to 1 P. M. is denoted by the lowest number one, the weaker light earlier and later in the day by larger numbers which represent the increased degree of exposure required.

Weather Factors

The choice of factors by which to allow for the condition of the atmosphere is one which goes largely by individual judgment, since one person forms a different idea from another as to what is meant by, say, "diffused light." But the following gives a fair idea of what must be carried in mind's eye:

A. *Direct sun*, with white clouds in other parts of sky, reflecting light into shadows 1
B. *Sun without clouds in sky* . . . . $1\frac{1}{2}$
C. *Diffused light*, sky covered with light clouds, leaving light bright enough to cast a distinct shadow . 2
D. *Heavier clouds* over sky, no distinct shadows . . . 3

Thus, if the exposure is one second under condition A, it will be one and one-half seconds with the light as B, two seconds in "diffused light," and three seconds with "heavier clouds."

Subject Factors

Further, it is neccessary to allow for the shaded character of the subject, which is perhaps the factor which leaves most to the judgment. We have already given figures showing the proportional exposures required by "open landscape," etc. In using a calculator, we have no means of actually measuring the light, and therefore we must be guided by the following figures, which indicate the number of times an exposure on a "strong foreground" (Fig. 3) must be multiplied, other conditions remaining the same:

Portraits, head and shoulders in shade . . . . × 4
Woodlands, under trees . . . . × about 16
Interiors light in color and well lighted . . . . × about 80
Interiors dark . . . . × about 480 and upwards

More conveniently, reckon factor as eight and give

minutes instead of seconds,—that is, if "strong foreground" is found to require one-fourth second at *f* 22, —multiply $\frac{1}{4}$ by 8 (= 2) and give two *minutes* at this aperture.

Tables and Calculators

Now there are two ways of putting this string of figures and factors into handy form. We may embody as many of them as we can into a table and multiply the expos-

Woodland subject, about sixteen times exposure of standard "strong foreground" subject, C

ures there set forth when other conditions so require; or we may set out the factors on a series of sliding scales, so as to dispense with the after-multiplication. The following table repesents about the most compact form which the first plan can take. It leaves out of consideration the variation of light with the day and the year (tables A and B) and with the state of the atmosphere, as well as the greater exposure needed with slower plates. To allow for these, we shall need to multiply the exposures first by a figure in Table A or B,

Exposures in Brightest Summer Sunlight (Clouds in Sky Reflecting Light into the Subject) on Ultra-rapid Plates of Speed, 250 Watkins (111 Wynne)

At other times of day and other states of atmosphere, these figures must be multiplied by the necessary factors; also, by still a third factor when using slower plates

	Clouds	Sea	Open (distant) Landscape **Subject A**	Light fore-ground, land-scape, etc. **Subject B**	Strong fore-ground, land-scape, etc. **Subject C**	Extra heavy foreground Subject D	Under trees	Interiors, light in color and well lighted		Interiors dark
								Min.	Sec.	Minutes
f 4	1-2000	1-1200	1-600	1-300	1-150	1-75	⅛		½	½
f 5.6	1-1200	1-600	1-300	1-150	1-75	1-35	¼		1	1
f 8	1-600	1-300	1-150	1-75	1-35	1-18	½		2	2
f 11	1-300	1-150	1-75	1-35	1-18	1-8	1		4	4
f 16	1-150	1-75	1-35	1-18	1-8	¼	2		8	8
f 22	1-75	1-35	1-18	1-8	¼	½	4		16	15
f 32	1-35	1-18	1-8	¼	½	1	8	½	—	30
f 45	1-18	1-8	¼	½	1	2	16	1	—	60
f 64	1-8	¼	½	1	2	4	30	2	—	120

second by $1\frac{1}{2}$, 2 or 3, to allow for state of the weather, and third by a figure from $1\frac{1}{2}$ to 6, according to the speed of the (slower) plate.

In commercial calculators, various arrangements are used to relieve the photographer of the trouble of these simple sums in multiplication: but it should not be imagined that the indications of the exposures become any more accurate from the fact that the actual arithmetic process is in some measure disguised. It is unnecessary to deal at length with the different types of calculator on the market. They are easy enough to understand and use, and, with the qualifications which have been named, are most useful aids to correct exposure of outdoor subjects in bright summer lighting, though, as already mentioned, of much less value when the light is weak, early or late in the day, or when the subject is of a kind which is much shaded from the light. One of the most convenient calculators is that issued with the "Wellcome Exposure Record and Diary." It is used in conjunction with a series of tables of light values and of plate speeds, the data in the latter including practically every plate on the American and British markets. Other exposure calculators which are sold as separate instruments are the Wager Exposure scale, the Cheape Exposure meter, the Simplex Exposure meter (United States), and the Phillips and Biermann meters, in England, where also several plate-makers, in addition to the Ilford Co., issue calculators specially for use with their products. These include Wellington and Ward, the Imperial Company, and the Paget Prize Plate Company.

Making a Calculator

It might be thought that, with these various patterns in the market, there could be no object in making a calculator for one's own use; but for special purposes such a home-made calculator is more convenient than any which can be bought. It can be drawn up to go (if so desired) by the standard time, instead of the "mean time" of the place; it can provide exposures for the stops one's lens carries; and, further, it can be marked with the particular setting of a shutter necessary to give a given exposure,—a precaution which, as we shall see directly, is one not to be lost sight of. I will therefore describe

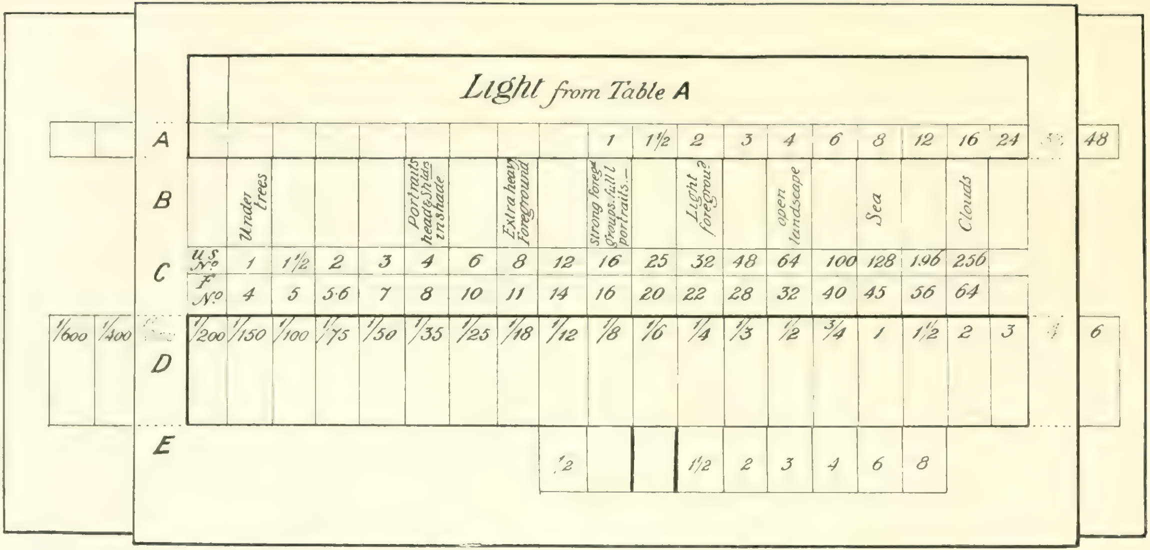


Diagram showing front of Home-made Calculator (page 414)

how to make a calculator which need not be much larger than a postal card, nor thicker than one or two stuck together. It consists of a sheath of card, from the front side of which two strips are cut, giving the apertures A and D. Within the sheath slides a card, bearing the figures relating to the light A, and the times of exposure D. The sliding card and the face of the sheath are ruled with lines about ¼-inch apart. In placing the figures on these scales, the most convenient plan is to make each division 1½ times that preceding it, or as near to this as can be done whilst using round numbers.

The first thing is to construct a table of light-values, to which (if we so wish it) the standard time of, say, Cincinnati, which is twenty-two minutes east of the ninetieth meridian, will apply. That is, the "mean" times of the tables must be reduced by twenty-two minutes to bring it back to "standard." For use with most tables this will not make much difference, but with the more accurate tables of Mr. Alves it is of advantage to employ it. However, in order to explain the construction of a calculator, we will take the more approximate table A already given for latitude 40°. This we shall paste on the back of the sheath, adding two others,—one for diffused light with double the numbers of table A doubled, and one for heavier clouds,—with the numbers three times those in table A, taking in each case the nearest whole number of those in line A of the calculator diagram, if the result of multiplication does not give it exactly.

On B we set off the figures for subjects, placing these one or more divisions apart, according to their requiring greater or less exposure than a strong foreground, remembering that a separation of one division means twice or half the exposure, according as subject is placed to left or right.

On the opposite edge of this part or the front sheath is placed a series C of diaphragm numbers, each again requiring one-and-one-half times the exposure of the preceding. This is conveniently marked in both American (U. S.) and *f*/ numbers.

Now we have to fill in the exposure scale D with numbers, each increasing by one-and-one-half. The

thing we have to do is start at such a point in the scale that the exposure opposite each *f* number shall be that to be given to a plate of given rapidity, choice must therefore be made of this latter. It is most convenient to assume a plate equal to the average ultra-rapid of 250 Watkins, or *f* 111 Wynne.

This is equivalent to about one-seventy-fifth of a second on a standard subject in best summer light with *f* 5.6 stop. That is, setting "strong foreground" to 1 from our table, we must place the series of exposures on scale D, so that one-seventy-fifth opposes *f* 5.6. The other exposures then follow as shown in the diagram.

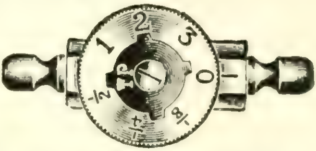
Using the Calculator

To use the calculator, look out the number in the tables on the back corresponding with the time of day and year and condition of atmosphere, and set this opposite the subject on scale B. On scale D, opposite the whole series of diaphragm will be seen the exposures for a plate of 250 Watkins, F III Wynne. If it is required to see the exposure on a faster or slower plate, the exposure for the stop to be used, say one-seventy-fifth second, is brought opposite the two heavy lines on scale E, when the exposure of a more rapid emulsion and for those of slower speed are seen opposite the respective figures, ½, 1½, 2, etc.

Giving Exposure Correctly

Assuming, for the moment, that a study of the preceding pages has put the reader in the way to find out what is a reasonably correct exposure under given conditions, we must spare some lines for a few hints on how to ensure that the plate actually receives this discovered correct exposure. Exposures greater than, say, ten seconds, need not trouble us: they can be accurately timed with a watch. From ten seconds down to, say, two seconds, it is usual to time by counting, and various little dodges are in common use for aiding one to count seconds more correctly than one is likely to do simply by repeating One—Two—Three—etc., slowly. Every one has his pet formula for this purpose, of which one of the oldest is to count a b c d e f one, a b c d e f two, and so on, as rapidly as possible. This will give seconds so correctly that one is rarely a second out in using it to

count up to one minute. A similar kind of incantation is: One lit-tle second, two lit-tle seconds, three lit-tle seconds, and so on. From a time of one or two seconds down to one-fourth or one-eighth of a second is the most awkward period series of exposures to give correctly. Shutters, except those of the more expensive type, rarely give an exposure of less than one-tenth or one-fifteenth of a second; so that, in the absence of one which is correctly adjusted to give these slower exposures, the most convenient method is that of the "time-exposure valve," which is fitted to the pneumatic release of any shutter working to "bulb." The accessory in the best known form, viz., that made by the Thornton Pickard Company, is shown in the drawing. It consists of a metal valve, the vent in which can be set more or less open by turning the disc. Air thus enters more or less quickly after pressing the bulb, and so the shutter is closed after a shorter or longer interval, corresponding with the numbers on the graduated disc. In order that the valve shall work regularly, it is advisable to fit the bulb with a pair of metal pressure plates. These produce an even pressure each time, and avoid the uneven impulse which may be given to the bulb with the fingers.



Shutter Exposures

The greatest troubles commence when we come to the use of shutters giving exposures from one-tenth of a second and less, owing to the fact that the actual exposure given may not agree with the times (speeds) marked on the shutter; whilst shutters also differ in 'efficiency,' that is, in the degree to which they allow the full aperture of the lens to be in action during the whole period of exposure. The first source of error is, of course, the fault of the shutter-maker, who, however, cannot be expected to provide invariably correct speeds in the case of shutters the price of which is remarkably low. In diaphragm shutters the error is usually in two directions; the slowest speeds are not so slow as marked, whilst the highest

speeds are not so rapid as marked. Roller-blind shutters are less liable to be much at variance with the marked speeds, whilst focal-plane shutters are usually fairly correct to marking.

As regards efficiency, the focal-plane shutter, providing the slit does actually work close to the plate, say, within ¼-inch, allows the full aperture of the lens to act during the whole time of the exposure. A roller-blind shutter, with an aperture in the blind long in comparison to the diameter of the lens (say ten times this latter), is not far short of the focal-plane. Both these shutters may be taken as giving exposures which are fairly comparable with time exposures given with a cap. That is to say, one-twentieth of a second at *f*/5.6 given with either of them will be truly equivalent to the three seconds which represents the corresponding correct exposure at *f*/45. That will not be the case with some shutters, the efficiency of which is only one half, necessitating, in the above instance, one-tenth of a second at *f*/5.6 to obtain the same degree of exposure as three seconds at *f*/45.

The Moral It would take us too far from our present subject to go further into the question, but I can put the practical moral into a few words: In finding, as directed in an earlier paragraph, the speed number of the plate, make the exposure by the means which you will most usually employ in practice. If your work chiefly runs to time exposures, let the test be in this way, selecting a stop which will allow of your giving at least five seconds. If the exposures are to be chiefly instantaneous, use the shutter at the speed and with the lens which you will regularly employ. In this way you make an allowance for any departure of the shutter from correctness. Better, of course, if you can get the actual speed of your shutter measured, and in accordance therewith inscribe your meter or calculator to the effect; for example, that for a true one-thirtieth second, you must use your shutter at "one-fiftieth second." Fortunately for the great majority of ordinary hand-cameras,—that is, apart from exposures on very rapidly moving objects,—it is rarely necessary to use a shorter exposure than one-fiftieth sec-

ond; so that my first advice to allow for the shutter in the plate-speed is really a practical one, dreadfully unscientific though it is.

Diaphragm Shutters

I add a further note on these shutters because what has already been written may unjustifiably prejudice the reader against them. It is true that there are more examples of variation in this class of shutter than any other, but a number of excellent patterns are on the market, such as the Bausch and Lomb "Volute," the "Compound" and "Koilos," the "Ibso," and the remarkable "Multi-speed." This latter, owing to the special pivotal construction of the plates which cover and uncover the aperture, greatly reduces the periods of opening and closing, and so allows the full lens to act during a very large proportion of the total time (= high efficiency). In the case of shutters of the ordinary patterns, a very good plan is to use one a size larger than the lens, e. g., a 5 x 7 shutter on a 4 x 5 or quarter plate. One thus utilizes the period of the shutter's movement when the aperture is fully uncovered, and so gets higher efficiency.

Ortho-Screen Exposures

Of late years, improvements in both orthochromatic plates and light filters have opened up a new power in hand-camera photography,—that of the use of a screened iso plate for snap-shot work; it will therefore be useful to include a mention of the limits within which work of this kind can be done with reasonable expectation of satisfactory results. Then recent advances have been in the production of high-speed color-sensitive plates, such as the Eastman "Isochromatic," the Cramer "Instantaneous Iso," the Seed "Ortho L" and "Ortho C," which we may roughly class together as regards speed at about 200 Watkins. A still more rapid plate, the Barnet "Super Speed Ortho," recently placed on the British and American markets with a speed of over 300 Watkins, seems to foreshadow still further introductions of orthochromatic plates of extreme speed. Hand in hand with this progress in emulsions, makers of light-filters, Cramer and Wratten & Wainwright in particular, have produced screens which, owing to their greater transparency, give the same amount of correction with a less

increase in exposure compared with the now obsolete filters of colored glass. We may now take it that a filter giving a requisite amount of correction will not need more than three or four times the exposure without it in the case of these ortho plates, and in many instances that a filter of multiplying factor of two will suffice. This being so, it will be seen that, with a lens at *f* 6 in bright summer light, exposures of one-twentieth to one thirtieth second are quite practicable, and that still shorter times may be given with a large-aperture anastigmat of *f* 4.5 — a facility for the use of which is provided by a reflex camera. Quite recently in the winter light of London, England, the writer made a series of snapshot exposures through a filter on one of the new rapid iso plates, which shewed the great powers afforded in this way.

Exposures on Moving Objects

When we come to work out the exposure which we must give in the case of objects which are in motion, we have to go on a totally different system. We have not to expose *long enough* to get a proper rendering of the light and shade, but *short enough* to prevent the object forming a blurred image in the photograph, in consequence of the image moving on the plate during the time the lens remains uncovered. In short, as a general rule, exposure which is correct as regards getting a moving object sharp on the plate is a different thing from an exposure which gives a correct rendering of the light and shade in the same subject. Usually it is a good deal less; and one may take it that, whenever we are exposing rapidly enough to secure sharp images of objects in rapid motion, we may look forward to under-exposure in the ordinary sense of the word. I might elaborate a theory of the time which must not be exceeded in photographing moving objects at various distances and with lenses of different focal lengths. The basis of such a theory is that the image of the moving object must not move more than one-one-hundredth of an inch on the plate during the exposure; better not more than one-two-hundredth of an inch if a high degree of sharpness is desired. But I will leave my readers with a liking for calculations to work the stages of the process out for themselves, which they can readily do from the simple laws of the forma-

tion of an image by a lens or by reference to THE PHOTO-MINIATURE No. 77. Here we must get straight to a guide which we can adopt in practical work. As a most useful basis, we will take that of a lens of five inches focal length, supposing the object to be twenty-five feet away, or approximately the width of a roadway in which not more that three vehicles can pass each other readily. This condition means that a man of six feet will appear on the plate one inch in height, and similarly other objects will be reproduced about one-seventieth their actual size. Keeping these fairly average conditions in mind, we must further learn that it is the *direction* in which an object is moving with regard to the camera which very greatly decides the speed of shutter which is necessary or permissible. If the subject is advancing directly towards the camera,—that is, more or less along the axis of the lens,—the movement is far less apparent than if he is crossing the field of view at right angles. Roughly it may be said that, in the case of the "end on" movement, the exposure can be three times that which is necessary to secure sharpness when the subject is going across the field of view. If the movement is obliquely toward us,—or, what is the same thing, if the camera is directed obliquely to the path along which the object is moving,—the exposure may be about twice that necessary for the "cross" movement. To take a concrete case of a carriage moving, say, at eight miles per hour, the exposure will be about as follows: End on, one-eightieth second; oblique, one-one-hundred-fiftieth second; cross, one-two-hundred-fiftieth second.

This is a rough guide to the effect of direction. As a rule, the high speeds which are necessary to secure sharpness of objects moving across the field make it impossible to deal successfully with anything but a walking pace under these conditions,—that is, with the majority of shutters which do not go above one-two-hundredth of a second.

The further the object or the shorter the focal length of the lens, the smaller the image, and the longer we can expose without sacrificing sharpness. Thus, if the object is fifty feet instead of twenty-five feet away, we can give double; if one-hundred feet away, four times

the exposure. A useful table of speeds for a variety of moving objects under the above standard conditions is given in the "Wellcome Exposure Record." We may give here one or two, which perhaps represent the generality of work:

Subject	End on	Oblique	Across
	Second	Second	Second
People walking	1-40	1-80	1-120
Carriages driving	1-100	1-200	1-300
Running, jumping, skipping . .	1-250	1-500	1-800
Cycle racing, etc.	1-300	1-600	1-1000
Train 30 miles per hour, 50 feet away	1-200	1-400	1-600
Train 60 miles per hour, 50 feet away	1-400	1-800	1-1200

One thing that cannot be allowed for in a table of this kind is the fact that, though an object may not be moving very rapidly as a whole, yet parts of it, the legs of a horse or the spokes of a wheel, are very likely moving at double this speed. A little blur of this kind is less objectionable than in the other parts, since to show subjects of this kind dead sharp everywhere is rather to kill any suggestion of movement.

Exposures from Trains, Cars and Boats

Exposures from moving vehicles follow just the same rules as those named in the preceding paragraph as regards direction: we must shorten exposures when we point the camera at right angles to the direction we are traveling in, but can give longer when the lens is directed forward or back at an angle, say, thirty degrees, which is quite possible from a train, whilst from a steamer or electric car we can photograph directly in front or behind. In the case of a train moving from forty to sixty miles per hour, it is not possible to count on securing subjects other than open views, such as bays, estuaries, or open country, and for these an exposure of from one-fortieth to one-sixtieth second will be quite short enough. In the case of steamers, the vibration from the motion of the ship

is generally greater; but, as the subjects will do with very short exposures, it is the easiest vehicle from which to photograph. The best position is by the paddle-boxes, where vibration is less than either forward or aft. The greatest difficulties surround the use of the camera from the top of an omnibus or electric car. The horse 'bus and, still more, the motor 'bus, usually vibrates to such an extent that the exposure requires to be much shorter than would be judged from its speed only. About one-two-hundredth of a second may be taken as a guide, and the photographer must stand when releasing the shutter, otherwise he gets all the benefit of the vibration.

When Speed is a Drawback There are one or two subjects of rapid movement where the results obtained by driving the shutter at too high a speed are the reverse of advantageous. Breaking waves, fountains and cascades are examples. With a very rapid exposure, say one-three-hundredth of a second, the drops and splashes of water are so bitingly defined that a "frozen" effect is obtained and is quite unnatural and unpleasant. It is necessary to give a longer time, which will allow these separate drops to fuse together in the photograph and give the effect which we do really see. If too long time is given, the "smoothed-out" result is just as objectionable in the other direction. A fair guide to these exposures is one-eightieth to one-hundred-and-fiftieth of a second, which is equivalent to about the top speed of a roller-blind and a good diaphragm shutter, respectively. For wave pictures in bright summer light with an extra-rapid plate, this will mean a stop of *f*/16 to *f*/11.

Cutting Down Exposure It is surely unnecessary to tell the reader of the foregoing paragraphs that, in the case of moving objects, we must often—in fact, usually—curtail the exposure much below that which we know to be necessary for the plate, in order to avoid movement in our rendering of the subject. In other words it is "not what we *would*, but what we *must*," if we wish to obtain a record unmarred by blurring. Therefore it is useful to obtain some idea of the degree to which we can cut down the expo-

sure which our plate calls for, in order to satisfy the demands (purely optical) made by the moving subject. The latitude which is permissible in this direction depends solely upon the plate, and upon a specific quality of the plate of rendering faint impressions of light. So that what will hold good with one plate will break down altogether with another. A rough sort of guide is provided by saying that for snap-shot work, where sharpness of definition of the moving objects is more important than the best rendering of the tones in the subject, one-half the "correct exposure" as found by the meter or calculator may be given. That means that we can take the speed of the plate as double the figure, usually adopted. As we have learned already the plate-speed is a convenient means of adjusting conditions. Here, by taking a plate as *f*,128 Wynne instead of *f*, 90, or 350 Watkins instead of 180, we can work straight along by the exposure tables and be fairly sure that, though we shall not be giving what are really full exposures, we shall nevertheless be getting reasonably good negatives. If these exposures are still too long, we can go a trifle further in this course of "frigid and calculated" under-exposure, as Mr Balfour might call it, say, to an extent represented by a plate-speed one-third of that adopted in the ordinary full-exposure way; that is to say, we might reckon out plate (just assumed to be 90 Wynne or 180 Watkins) as 156 Wynne or 500 Watkins.

In any case, the two simple factors, one-half and one-third, of the correct exposure are easily borne in mind, though, with them, please, the fact that some plates will come through this ordeal of cutting down exposure much more satisfactorily than others. The slower a plate is, as a rule, the better it will behave when it does not get its full exposure; but, even among extra-rapid plates, there are very notable differences, quite enough to even-up any supposed excess of speed.

Exposures in Night Photography

For exposures by moonlight or by street lighting at night, it is impossible to lay down very definite rules, as the illumination varies so enormously, but one or two *very* rough figures may be given as a guide.

With the moon at the full and a lens at $f/6$, the exposure for a landscape subject by moonlight will be from ten to thirty minutes on a plate of 200 to 250 Watkins. This will give a moonlight effect of dark shadows and somewhat harsh lighting. By exposing for very much longer time, the effect of ordinary daylight is obtained. In either case, the subject must be arranged on the plate so that the moon's disk is not included, otherwise the result is a band of light due to the movement of the planet. The moon can be included on the same plate by a separate exposure, after tilting the camera, for about one fourth second. The pseudo-moonlight effects made by turning the lens toward the sun in strong daylight are obtained by giving great under-exposure—one-tenth to one-twentieth of a second—at $f/22$ on a "medium-speed" plate, which should be backed.

For street scenes by night under arc or powerful gas lighting, the most favourable conditions are with snow or heavy rain on the ground. With $f/6$ on plates of about 200 Watkins exposure will be from five to ten minutes: twice this, or more, if very dark objects are in the neighborhood of the camera.

If the subject is all quite near to the camera and brightly illuminated, exposures will range from about one to five minutes.

Copying and Enlarging in the Camera

The rule that exposures must be proportional to the focal extension of the lens is very conveniently applied by the following method and tables, due, I think, to Mr. Alfred Watkins, to whom we owe numberless useful suggestions for simplifying exposure calculations. It is to use a small rod equal in length to the focus of the lens and divided into tenths.—Better still, is a tape marked in focal-lengths, and one-tenth focal-lengths. See how many times the focal length goes into the distance between the lens-diaphragm and the original which is being copied, and look up the nearest figure in Table 1. The figure immediately underneath in line B give the scale of reduction, (linear); those in lines C and D the relative exposure compared with those for a similar subject, with the lens at normal focus (on infinity) and when at double extension for copying same

size. When copying direct on an enlarged scale, a similar device is used to measure the distance between lens-diaphragm and plate in focal lengths. Look up this number in Table II, line A. The figure immediately underneath in line B gives the degree of enlargement; that in line C, the relative exposure compared with the lens at normal extension; and that in line D, exposure compared with the lens at double (same size) extension.

TABLE I—RELATIVE EXPOSURE WHEN COPYING ON A REDUCED SCALE

A—[illegible] length of lens divides into distance between lens and easel.	11	9	7	5	3	2[illegible]	2[illegible]	2[illegible]	2[illegible]	2
B—Proportion of image to original, i. e. degree of linear reduction.	1/[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5/9	[illegible]	[illegible]	[illegible]	1
C—Relative exposure compared with lens at normal extension.	1[illegible]	1[illegible]	1[illegible]	1[illegible]	2[illegible]	2[illegible]	2[illegible]	2[illegible]	3[illegible]	4
D—Rel. exp. compared with that when copying same size.	1/[illegible] (.3)	[illegible] (.31)	[illegible] (.34)	[illegible] (.39)	[illegible] (.56)	[illegible] (.60)	[illegible] (.66)	[illegible] (.73)	[illegible] (.83)	1

TABLE II—RELATIVE EXPOSURES WHEN COPYING ON AN ENLARGED SCALE

A	2	2[illegible]	2[illegible]	2[illegible]	3	$3\frac{1}{2}$	4	4[illegible]	5	6	7	8	9	10	11
B	1	1[illegible]	1[illegible]	1[illegible]	2	$2\frac{1}{2}$	3	3[illegible]	4	5	6	7	8	9	10
C	4	4[illegible]	5[illegible]	6[illegible]	9	12[illegible]	16	20	25	36	49	64	81	100	121
D	1	1[illegible]	1[illegible]	1[illegible]	$2\frac{1}{4}$	3	4	5	6[illegible]	9	12	16	20	25	30

BOOKS

The Watkins Manual of Exposure and Development. By Alfred Watkins. Price, 50 cents.

Watkins Exposure Notes and Record for use with Watkins Meters. Price, 50 cents.

The Photo-Miniature, No. 77; Focal Plane Photography. Price, 25 cents.

The Wellcome Photographic Exposure Record & Dairy. Price, 50 cents.

Notes and Comment

Numbers 2, 11, 16, 32, 38, and 75 of THE PHOTO-MINIATURE are wanted by several subscribers, anxious to complete their files of the magazine. Readers who have copies of these issues, and are willing to part with them at fifty cents apiece, will confer a favor by advising our publishers to that effect. By considerable effort, we have managed to get together three complete sets of THE PHOTO MINIATURE (Vols. I to VIII inclusive; Nos. 1 to 96). These are offered at $25 per set, delivered prepaid. Libraries and others desirous of securing a set of the magazine should make early application, as it is becoming increasingly difficult to get complete sets together, more than 40 of the 105 numbers published being now out-of-print and permanently retired from the series.

Enlargements on chloride papers (Velox, Cyko, Argo and Artura), giving all the advantages of these papers over bromide and offering the wonderful range in grades, surfaces, etc., of the chloride papers, are now obtainable commercially. These enlargements have all the sparkle, shadow detail and tone gradations of an original print. Those interested should write for the circular of information to H. W. Von Bremen, 27 East 22nd street, New York.

The Voigtlander & Sohn Optical Works, 225 Fifth Avenue, New York, have established a Western branch as 617-631 West Jackson Boulevard, Chicago, for the convenience of the trade and customers west of the Ohio River. The Chicago branch house, like the New York branch, will carry a full line of the Voigtlander lenses, cameras, binoculars and other optical specialties.

The three big exposure helps available for American readers of these pages are the "Wellcome Exposure Record and Diary," published by Burroughs, Wellcome & Co., 45 Lafayette street, New York; the Watkins Exposure Meters (several styles for different purposes), for which Burke & James, Chicago, are American agents; and the Wynne Infallible Exposure Meters, for which George Murphy Inc., New York, are Trade agents. All three can be obtained from any dealer in photographic supplies.

The most interesting collection of photographs of big game we have yet seen is contained in A. Radclyffe Dugmore's "Camera Adventures in the African Wilds," just published by Doubleday, Page & Co., New York, and William Heinemann, London. The illustrations are beautifully printed and the text is as thrilling a record of personal adventure as can be desired.

Now that the Antinous Shutter Release is obtainable for all makes and styles of exposure shutters in the market, the days of the fragile and pestiferous rubber bulb and tube should be numbered. We have used the Antinous Release since its first appearance, and cannot praise it too highly for its simplicity, convenience and infallible certainty of operation. It is manufactured by William Watson & Sons, London, and can be had from any dealer. Burke & James, of Chicago, and George Murphy Inc., of New York, are the American Trade Agents.

No 8 of the Telephoto Quarterly, recently issued, completes the second volume of this clever little magazine, which is the only periodical devoted exclusively to the possibilities and practical use of the telephotographic lens. Edited by an authority in this specialty, Captain Owen Wheeler, F.R.P.S., and fairly bristling with practical information and interesting illustrations, "T.-Q." is an eye-opener to the man who is not fully up-to

date in his knowledge of what can be done with a telephoto lens. Single copies 25 cents; yearly subscription 75 cents. Tennant and Ward, New York.

An exhibition of color photographs by Eduard J. Steichen was given at the Little Gallery of the Photo-Secession, 291 Fifth Avenue, New York, January 21 to February 5th. The show comprised many examples of Steichen's latest work in color, and was more largely attended than any recent exhibition at the little Gallery. About the same time, an exhibition of Steichen's paintings, with 25 photographs, was given at the old Montross Gallery, 372 Fifth Avenue. Among the photographs were three views of Rodin's famous Balzac, from negatives made at 11 P.M. and 4 A.M.

The New England branch of Ansco Company nas been removed to 46 Cornhill, Boston, Mass., where increased space makes it possible to carry a larger stock of Cyko and other Ansco goods, thus insuring a better service to the thousands of Cyko consumers throughout New England.

Hand-colored post-cards of local scenes are among the most attractive and profitable side lines the photographer, druggist or stationer can carry. In this line of work the National Colortype Co., Cincinnati, are acknowledged leaders, and readers are recommended to send their orders to this house as offering a good service at reasonable cost.

The publishers of our enterprising contemporary, "American Photography," Beacon Bldg., Boston, Mass., have secured the entire second edition (5,000 sets) of the "Complete Self-instructing Library of Practical Photography," and offer it to subscribers to "American Photography" at the net wholesale price. This is an unusual opportunity to secure this splendid library of photo-

graphic information, and our readers will consult their own advantage by sending for the illustrated prospectus of the work.

The latest issue of "Portrait," published by the Ansco Company, Binghamton, New York, gives a portrait of our friend Charles C. Kough, of Greensburg, Pa,. For years we have watched the professional career of Mr. Kough with more than ordinary interest. A man who loves his work and gives all his heart to its improvement, Mr. Kough has few equals in the difficult work of illuminating (or lighting) the figure in portraiture. His portraits of women have the qualities of plasticity, soft relief and brilliancy in a degree which we rarely find in professional portraiture, and we commend the study of his work to all who seek to excel in this specialty.

Those who are interested in the possibilities of photography in the illustration of advertising matter should not fail to see the January number of "Studio Light," published by the Eastman Kodak Co., Rochester, N. Y. In this issue are given the prize-winning pictures from the recent Advertising Contest, from negatives by William Shewell Ellis, Gertrude Kasebier, Bruguiere & Eisen, S. H. Liphey, and others of equal note.

A remarkable plate, according to the testimony of experts who have used it, is the new Barnet Super-Speed Ortho Plate (400 H&D), introduced in America by J. L. Lewis, 379 Sixth Avenue, New York. With this plate and a two-times ortho screen, snap-shot work in dull or wet weather and difficult flashlight work is not only possible, but as certain in result as it is simple, with the great advantage of correct color rendering.

The fifth edition of "Figures, Facts, and Formulæ of Photography," published as "The Photographic Annual," is almost completely sold out, only a few copies

remaining in the hands of the publishers or the trade. As many would-be purchasers of the last edition had to go without this wonderful photographic reference book, because they delayed until the edition was exhausted, readers who desire copies of the 1909 edition should secure them at once. Sold by all dealers, price 50 cents. Tennant and Ward, publishers.

The Fifth International Congress of Photography is to be held this year at Brussels, probably during the month of July. The last Congress was held at Liége, in 1905. The subscription fee of membership is ten francs. Applications, with remittances, should be sent to M. L. P. Clerk, 52 Boulevard Saint Jacques, Paris. Members receive a printed copy of the proceedings of the Congress, together with the papers read there, which is the chief advantage of membership to those who cannot attend the Congress in person.

The Linked Ring has decided not to hold a Salon in London this year. A few of the members propose to hold exhibitions of two or three men's work in some of the galleries, probably in the Spring. A Salon Club has been formed to hold the London Salon of 1910. This club includes J. H. Andersen, A. H. Blake, M. A., Mr. and Mrs. Will A. Cadby, Riginald W. Craigie, Chas. Emanuel, Chas. Job, Alexander Keighley, and J. B. B. Wellington, from amongst the members of the Linked Ring, while others have promised work for its exhibitions. Certain pictorialists, who are not members of the Ring, have joined the Salon Club, and it is assured of the active sympathy of Yarnall Abbott, Sidney Carter, Robert Demachy, Rudolph Duhrkoop, the brothers Hofmeister, Mortimer-Lamb, Paul Pichier, C. Puyo, and many others. Its effort will be to hold the most Catholic and inclusive exhibitions ever assembled of purely pictorial photography.

The Mill Dam. S. L. Coulthurst, F.R.P.S.
Direct print from the negative
(Compare with frontispiece on next page)

The Mill Dam: By S. L. Coulthurst, F.R.P.S.
Oil print, pigmented for broad effect
(Compare with direct print on preceding page)

The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT

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Oil and Bromoil Printing

In past issues of THE PHOTO-MINIATURE we have taken as our subject every one of the processes of photographic printing which offer the means of making visible everything in the negative. Everything—did we say? We recall the expression when we remember such methods as gum-bichromate, the avowed purpose of which is to permit the photographer to transfer as little of the negative to the print as he thinks fit. Other processes, or rather special methods of working them, allow of the same thing being done to a lesser degree, but none has approached the so-called "oil" and Bromoil methods in this facility or latitude of "control:" which word in this present connection may have quite a misleading signification, inasmuch as the one thing which is often evident in examples of the process is the inability of the worker to exercise a proper and pleasing control over the variations which he is pleased to play on the original air of his negative.

To this we will return later. Meanwhile, we must explain that in oil and Bromoil printing the basis upon which we build up the photographic image is a surface which to all intents and purposes is blank. An image there is, but so faint that in comparison with what is applied to the paper it is of no account. The full depth of picture is produced by the application of a pigment with a brush. In doing this, the worker can, if he likes, approximate fairly closely to the tones which the negative would give if printed in carbon or platinotype.

Equally, he can depart from this "straight" course to a very great extent—more than in any other process. At the same time he can see instantly what he is doing and, if he does not like it, can clear off all trace of the pigment he has applied and start afresh. With such features as these in its favor, no wonder that oil and Bromoil have fascinated European workers with artistic aims. The French pictorialists, headed by MM. Demachy and Puyo, were the first to show its possibilities, and speedily discarded gum-bichromate to work in "oil." British workers, with scarcely less enthusiasm, adopted "oil," evolved Bromoil—which is to "oil" what bromide or gaslight is to print-out paper—and have bracketed the two first among the processes which, with a touch of affectation, are termed the "media of personal expression." It will be clear, then, that if these processes open the path to splendid successes, they likewise hasten the journey to an Avernus of artistic offences. The fact remains that, with all their faults,—and the chief of these is that the essential part of the business is not photography at all,—they have awakened an immense amount of interest in Europe. Therefore, now that the working methods are well established and the materials for their practice obtainable here, it is fitting that the precise instructions should be brought together, and the American worker put in the position to "try out" in "oil" for himself.

The Principles

The basis of the processes is very simple. It is that of the collotype process, so largely used for the better grades of postal cards. In the collotype process, a plate, usually of glass, is coated with a mixture of gelatine, which is rendered sensitive to light by soaking in a solution of potassium bichromate. As workers of the carbon process well know, such a surface, on exposure to light, becomes insoluble in hot water. But that is not the only change. There is another which is of even greater technical importance. In proportion to the action of the light upon it, a film of bichromated gelatine acquires the power of retaining any greasy ink which is applied to it in a suitable way. A wet film of unexposed gelatine, whether containing bichromate or not, repels, instead of attract-

ing, greasy ink ; but, after exposure to light, it passes into a peculiar hardened condition wherein it holds a film of ink which is presented to it, say, on a roller. This is the basis of the collotype process, the sensitized glass plate being exposed under a negative, soaked in water and, while still wet, " inked up " with a roller lightly charged with a greasy ink. The inked positive impression on the glass is the so-called " collotype plate," from which large numbers of prints may be obtained by bringing paper in contact with the surface, in presses constructed for the purpose. Collotype dates back to the year 1855, when it was invented by Poitevin in France. Except for the suggestion of an English worker named Asser, in 1860, the idea of obtaining the positive image of hardened gelatine on paper, and from this producing *one* pigment print by means of a brush, never seems to have occurred to anybody until Mr. G. E. H. Rawlins, in the "Amateur Photographer" (1904), drew attention to the ready means thus provided for building up the picture with any modifications in tone which seemed desirable. At the same time he offered working instructions for carrying out the process in this modified form.

In the case of Bromoil, the intermediate result is similar, i. e., an invisible or nearly invisible image composed of hardened gelatine; but the steps by which it is secured are different. The starting point is a bromide print, which by chemical treatment is bleached away, leaving in its place the semi-visible image to which the ink is applied. There is no exposure to light, subsequent to making the bromide print from the negative in the first instance. The developed silver image of the print serves the same purpose as the exposure to light in the case of the "oil" method, although it must be admitted that at present no satisfactory explanation of the actual nature of this process has been forthcoming.

Features of Each Process

Before passing at once to the working methods of " oil " and Bromoil, a word may be said as to the relative advantages which each offers to the worker. " Oil " is a contact printing method. The sensitive paper requires to be exposed to the negative by daylight : the sensitiveness

of the bichromated paper is on a par with that of carbon tissue, so that the printing from the negative has to be done by daylight. In other words, so far as concerns exposure, "oil" is more akin to carbon than to any other process. This means that unless the original negative is of fair size, at least 5 x 7, or better, 8 x 10, an enlarged negative requires to be made. Oil prints smaller than 5 x 7 are not really practicable, since the fineness of the details of the subject on this small scale makes it difficult to carry out the local application of the ink. Bromoil, on the other hand, simply means making first of all a bromide print or enlargement from the negative. When such a good print has been made, the rest depends only on properly carrying out the bleaching operation and the subsequent treatment. So far as results, the general opinion is that the "oil" method gives somewhat finer effects; that is to say, the final result has more of the characteristic quality of this class of print than that made by Bromoil. Moreover, with "oil," it is possible to do more in the pigmenting process, whilst retaining this quality, than is the case with Bromoil. Lastly, "oil" is certainly less liable to unexplained causes of failure, such as difficulty in getting the ink to take, than Bromoil. Not that Bromoil must be represented as an erratic method, but there is the fact that carelessness in the bleaching and subsequent treatment is more likely to cause trouble than will the same neglect of proper precaution in the case of "oil." This, however, need not for a moment deter the worker from availing himself of the facilities of working in the evenings which the Bromoil method provides.

The Oil Process

Now let us take a brief preliminary run through the procedure of the "oil" method before making ourselves acquainted with actual working details. Assuming we have at disposal a suitable enlarged or direct negative, step No. 1 is to sensitize the sheet of gelatine-coated paper which will form the final print. This is done the evening before the day of printing if the ordinary carbon sensitizer is used, or immediately before use if the more convenient and efficient form of quick-drying autotype spirit sensitizer is adopted. Step No. 2 consists in

printing under the negative. Step No. 3 is simply the removal of the bichromate sensitizer by washing the print in water for about twenty minutes, followed by about an hour's soaking in water, in order to let the gelatine swell to the full. If preferred, the washed print can be put aside to dry, and the latter part of the process taken up at any convenient time later. Step No. 4, and last, is the "development" or pigmenting of the print (as it lies on a moist pad) with ink applied with a brush, or rather with a series of brushes. This is the part of the process calling for the greatest practice—and, of course, also for the sense of what is an improvement of the picture. It is also the part of the process of which least can be taught in the handbook.

The Negative The type of negative necessary to secure the richness which is the mark of a good "oil" print is one with clean shadows free from fog and without undue density in the high-lights,—in other words a negative which is first-rate for carbon or platinotype. Naturally, a process like "oil" will give results from negatives which would be useless for any other process; but still the process, if it is to be seen at its best, does require a really good negative. The making of an enlarged negative is beyond the scope of the present monograph, and is moreover fully dealt with in No. 100 of THE PHOTO-MINIATURE. One point only may be mentioned, as it is the most common mistake among those that are beginners in such work. In preparing the positive transparency by contact from the original negative, use a fairly rapid negative plate, not a plate of the lantern or photo-mechanical type which gives great brilliancy. This latter quality is just the one which must be avoided in a diapositive or transparency which is to be enlarged. The transparency should have no clear glass anywhere. There should be full detail all over, but the high-lights have quite a decided veil over them. Enlarged onto a lantern, or photo-mechanical plate, or negative paper, such a diapositive as this will give an excellent result without the great increase in contrast—even to the point of hardness—which is the common defect in enlarged negatives.

In Old Nuremberg
Direct bromide print from negative

In Old Nuremberg: F. C. Tilney

Bromoil print showing the subordinate values given to the more distant parts of the subject

Papers for Sensitizing The paper for the "oil" process is simply one of a fairly smooth surface, coated with fairly hard gelatine. Papers for the purpose are now specially manufactured, those already on the American market being the Autotype Company's (Burke & James, Chicago; Hirsch & Kaiser, San Francisco; George Murphy, Inc., New York). In Britain, of course, from the Autotype Company, London. Nos. 1 and 2 of these papers are the white and toned respectively, the latter a somewhat deep cream tint, which is especially suitable if pigmenting is to be done with brown or sepia ink. Both these papers have little surface to them, they are not rough nor yet dead smooth. The No. 3 paper (white) is rather smoother, resembling a "cream wove" writing paper. These papers are put out in sheets from 4¼ x 5¼ to 12½ x 15½ inches, beyond which size the worker in oil is not likely to be enticed, on account of the time occupied in the pigmenting process and, in what sometimes takes almost as long, cleaning up the print afterward, removing tiny particles of hair, etc. Some workers are quite content with papers having a lighter coating of gelatine than those specially prepared, and have used the double transfer papers supplied by makers of carbon tissue. Thus, the Autotype double transfer papers, Nos. 76 and 77, are very suitable for oil printing.

The Ozobrome Company, London, also make four papers specially for the oil-process: OF, (cream crayon), OB (white medium grain), OO (toned etching), and OC (white etching).

Griffin & Sons, London, who were in the field with materials for the oil process as early as 1906, supply gelatine-coated paper prepared according to the formula of Mr. Rawlins, and sold under the uneuphonious name of "Pigmoil." It is issued in two varieties, rough and smooth, both white and both giving a surface which takes the pigment most readily in the shadows, and equally repels it vigorously in the high-lights. The makers' claim for the paper, that it gives a very high degree of brilliance, is certainly borne out by its behaviour. Messrs. Griffin have already placed supplies of the paper with dealers in the United States, among

whom may be named Ralph Harris & Co., Boston, and J. L. Lewis, New York.

Other makes of double-transfer paper which have found special favor are those of Thomas Illingworth, which M. Demachy recommends, and of Elliott & Sons, Barnet, England; (G. Gennert, New York,) and the Rotograph Company, London.

In cutting paper to size for printing, it is well to leave a margin all around of at least half an inch in width. If the picture be printed close up to the edges of the paper, the brush used in pigmenting cannot be easily kept off the almost wet support on which the print is laid at this stage of the process, and the result is that the hairs of the brush lose their shape sooner than they would otherwise.

Gelatine Coating of Paper

With so many varieties of paper available for the process, the worker is not likely to find it necessary to prepare his own; still, for the sake of those adventurous and discontented souls who must forever be trying something beyond the limits which Providence and the manufacturers have set, we will name one or two methods by which an even coating of gelatine may be applied to any suitable paper.

The method of applying the gelatine requires to be selected with reference to the character of the paper: a smooth paper can be floated on the gelatine solution, or the latter may be flowed over the paper, in which case the paper must be placed on a leveled glass plate. In the case of rough papers, these methods do not give a sufficient intimacy of application right into the depressions on the surface. For such papers, the gelatine solution needs to be applied with a brush. The novice in this work cannot expect to obtain the quite even coating of the machine-prepared paper, particularly in the case of large sheets; but, as these are not likely to be required in the oil process, there is no reason why the gelatine coating should not be done by the worker who is unable to get exactly the material to his liking. First, the coating and soaking methods for smooth papers, as distinguished from the brushing for the rougher. The gelatine solution of strength given below

is filtered through muslin immediately before use, is placed at hand, and kept at a suitable temperature by standing the containing vessel in warm water. A glass plate, a little larger than the sheet, is adjusted level, and then raised in temperature by dipping in warm water, the paper to be coated being also immersed. The two are brought together under water, the paper lightly squeegeed, and the glass replaced on the leveling wedges or screws. The gelatine solution is then poured on the paper and allowed to flow over, the paper being removed from the glass when the gelatine has set. A suitable strength of solution is 30 grains per ounce of water, two ounces of which is an average quantity for a sheet 12 x 15 inches. Instead of flowing on, a useful artifice to secure the gelatine-coating on one side of the paper only is to place two pieces back to back, and to draw the pair steadily through the gelatine solution. Each pair of sheets, still unseparated, is hung up to dry, and the edges then trimmed away, when it will be found that when the papers are carefully manipulated the solution creeps in between the two not more than half an inch.

For rough papers, the solution must be brushed over the surface. A suitable solution for this purpose is that commonly used in making double transfer papers. If one application does not give a thick enough coating, the best plan is to repeat the process, after the paper has dried, rather than use a stronger solution. Nelson's No. 1 gelatine, 1 ounce; water, 20 ounces; chrome alum, dissolved in 1½ ounces hot water, 12 to 15 grains; alcohol, 1½ ounces.

In making up this mixture, the gelatine is first put into the cold water until completely swollen, and then rendered fluid by placing the vessel in hot water, in the usual way. It is then brought to a temperature of about 130° Fahr., and the chrome-alum solution at about the same temperature added in small doses, with constant stirring. The spirit, also in small lots, is last added. This solution is kept at about 130° Fahr., and applied to the paper with a large, flat, soft hog-hair varnish brush, one of three or four inches' breadth. This operation must not be done in a cold room, or the gelatine

will set so quickly as to make it impossible to give a coating free from streaks. Temperature should be at least 75° Fahr.

These formulæ and directions will, as we have said, enable the worker to prepare his own papers; though he will be well advised to employ, at any rate to commence with, a commercial double-transfer paper of good quality readily obtainable at any supply store.

Sensitizing the Paper The gelatine-coated paper, as purchased, will keep in good condition indefinitely. Sensitized, it may be kept, say, for three or four days, but the best results are secured by printing within an hour or so of the paper's drying. The sensitizer may be the solution of potassium, or other bichromate customary in carbon printing, and used by immersing the paper in it; but the drawback to this method, from the amateur worker's standpoint, is that sensitizing must be done the night preceding printing, in order to allow the paper to dry. This means that if, as is often the case, the weather then proves unsuitable for printing, or if something else intervenes to postpone the work, the paper is most probably spoilt. A method of sensitizing which can be completed within a few minutes is a much more convenient one when working on this small scale, whilst the results which it gives are, if anything, superior to those by the slower process. The beginner is therefore strongly advised to adopt the use of a spirit or quick-drying sensitizer applied by hand to the paper, in preference to the use of plain water solution of bichromate in which paper is immersed. We will therefore take the spirit sensitizer first.

Rapid Sensitizing In preparing a spirit sensitizer, ammonium and not potassium bichromate must be used, on account of its greater solubility in the spirituous mixture. One excellent formula is that of M. Demachy's: A 6 per cent solution of ammonium bichromate is made by dissolving 1½ ounces of the salt in 25 ounces of water. The sensitizing mixture is made by well stirring 1 part of this bichromate solution with 2 parts of 90 deg. alcohol. About three quarters of an ounce of this mixture will

A Bavarian Village
Direct print from negative

A Bavarian Village: F. C. Tilney

Bromoil print, showing light accents put in on bush at the left, the distance and middle distance thrown back and sky added

suffice for six 8 x 10 pieces of double transfer paper. The paper is pinned to a drawing-board, and the sensitizer applied with a flat hog-hair brush. M. Demachy thus describes his exact working method: "Dip the extremity of your brush in the alcoholic mixture, draw it horizontally along the upper part of the sheet, and, with rapid downward strokes, gather the solution from the top streak and cover the whole sheet. But only the tip of the brush must be immersed in the bichromate solution. The gelatine coating of the double transfer papers is so thin that it will absorb only a very small bulk of liquid. If the quantity applied is superior to the power of absorption, the solution will settle in small pools and will cause streaks under the action of the brush. In such a case, the streaks can be removed by passing a dry and perfectly clean camel's-hair brush, or badger softener, over the still wet surface of the sheet." The paper will usually take less than fifteen minutes to dry, and both drying and sensitizing may be done by weak daylight; but when the paper is dry it becomes much more sensitive, and therefore this part of the process is best to be done in a dark room, or one lighted only by yellow light.

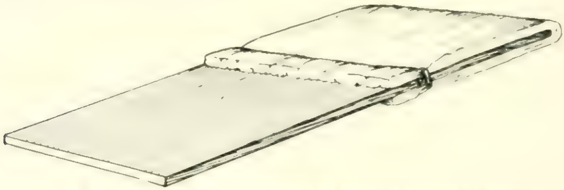


FIG. 1. Blanchard brush, a strip of flannel bound to glass
Used in applying the spirit sensitizer

Autotype Spirit Sensitizer

The Autotype Company's preparation, supplied for the rapid sensitizing of carbon tissue, is excellent for "oil" paper. Mr. S. L. Coulthurst has specially recommended it to the beginner in the process, on the ground that this factor in the process is thus kept standard. For applying it, the makers supply with each bottle one of the old-fashioned Blanchard brushes (fig. 1), which is a slip of glass about 6 x 2½ inches, to one end of

which a piece of flannel is strapped by an elastic band. The paper to be sensitized is pinned to a drawing-board by means of thumb-tacks, interposing one thickness of dry blotting-paper. The "brush" is dipped in the sensitizer and drawn in parallel strokes over the paper, a very even coating being thus applied. In a warm place, the paper will become dry in about ten minutes. The whole operation requires scarcely a quarter of an hour even in unexperienced hands.

Other Sensitizers

Those who have experience in sensitizing carbon tissue in the ordinary bichromate baths, as described in THE PHOTO-MINIATURE No. 86, will perhaps prefer to use the older method of *immersing* the paper in a solution of bichromate in water. Some "oil" workers prefer to use a somewhat weak sensitizer, namely 2 to 3 per cent, instead of the 4 per cent, which is the average for the carbon process. Mr. Rawlins, on the other hand, advises a 5 per cent solution of potassium bichromate. Mr. James A. Sinclair, one of the pictorial workers of ten years ago who has been attracted back to the ranks of exhibitors by oil, prefers the carbon sensitizer given by Mr. H. W. Bennett, and made as follows: Potass bichromate, 240 grains; citric acid, 60 grains; water, 25 ounces; ammonia .880, enough to turn the orange tint of the solution to lemon-yellow (usually about 3 drams). For the Pigmoil paper a similar sensitizer is prescribed as follows: Potassium bichromate, 200 grains; potass citrate, 2 ½ ozs.; citric acid, 100 grains; water, 25 ozs.

In sensitizing papers with any of these solutions, a useful little dodge is that of Mr. Rawlins: Select a quite flat-bottomed dish, a couple of sizes larger than the paper, pour in the sensitizer, immerse the paper for about two minutes, and then pour off the liquid, leaving the dish in a sloping position. The paper is then drawn slowly off by an upper corner, and this action, if repeated twice for the face and once for the back of the sheet, removes all excess of sensitizer and avoids the formation of drops on the surface. Paper sensitized in baths containing no spirit must be put to dry where there is free access of air, so that drying takes place in

not more than five or six hours; otherwise partial insolubility of the gelatine supervenes, and the paper will of course not work properly. In short, one works with just the precautions necessary when sensitizing carbon tissue in ordinary practice.

Printing

Unlike carbon, the sensitive oil paper gives a visible or semi-visible image, there being, of course, no pigment in the gelatine to mask the action which the light produces. The effect of sufficient exposure under a negative is to give a brown image something like that of a platinotype print at the same stage. Exposure can be controlled just as in the latter process, and, with a little practice, this is the best method. When sufficiently printed, the paper should show a fairly distinct brown image on the yellow ground, with detail visible in the high-lights. In good summer light (shade, not sun), this will mean an exposure of about five minutes from a clean quick-printing negative. The paper, remember, is more sensitive to daylight than gelatine print-out paper, and therefore requires to be more carefully handled; frames should be filled and the print examined only by the weak daylight of a room, or by gaslight. Remember, too, that certainty in exposure is largely conditioned by having the paper bone-dry when placed in the frame, and, in damp weather, by taking the same precautions in the shape of rubber pressure pads as in platinotype printing.

Some workers, M. Demachy among them, prefer to expose by actinometer, and it is a reliable method. Still, the beginner who has no experience of it need not thereby be deterred from taking up "oil."

Preparing for Pigmenting

The exposed print should be washed in water immediately after exposure. The object of the washing is two-fold, —to remove the unaltered yellow bichromate and to bring the exposed surface into the necessary swollen condition for pigmenting. Washing in running water will remove the bichromate in twenty minutes, or still more rapidly if a little potass metabisulphite or bisulphite liquor (a few grains or minims to 20 ounces of water) be added, to form a bath which is applied after

one or two soaks (or a minute or two's washing) have been given in plain water. The subsequent soaking process is much longer, the time depending on the character and thickness of the gelatine coating. In the case of a thinly coated paper, such as an ordinary double-transfer, half an hour will probably be enough; for papers more thickly coated, two or three hours or even longer. The result of this soaking is to cause the image to appear (when surface water is blotted off with clean soft cambric) in slight but well marked relief, and unless this is the case it is useless to expect it to take the pigment as it should. The chief cause of failure here is letting the water in which the print soaks be too cold. If it falls appreciably below 65° Fahr., it loses its effect to a great extent. The temperature should be slightly over 65° Fahr., from that to 70° Fahr., but not warmer. It is useless to try to dodge this degree of heat by adding warm water every now and then to a cold bath. The dish should be put into a room at a steady temperature, and the print left to itself in the water, beyond an occasional rocking of the dish. If, after this soak, it is thought well to defer pigmenting, the print can be dried and put away. It is prepared again for pigmenting by giving an hour's soaking in water, or longer, again at a temperature between 65° and 70° Fahr. In fact, this drying hardens the film as a whole, and while it appears to be without disadvantage it enables the print to withstand pigmenting better.

Inks A great deal depends upon the use of a suitable ink. Mr. Rawlins, soon after his introduction of the process, placed a special ink on the market in England, through Messrs. Griffin, and has lately much improved his product. Inks for the oil process (they apply equally to Bromoil) are also made by the firm of Jas. A. Sinclair & Co., London. But the worker in America who cannot obtain these supplies need therefore not lose a day in getting to work. Let him obtain from a dealer in printers' supplies some samples of ink, as used for the best class of half-tone printing or collotype work. Let him ask for a good "hard" ink of one or other of these kinds. These inks are not of the hardest or stiffest class, and a

A Bavarian Castle
Direct bromide print from the negative

A Bavarian Castle: By F. C. Tilney
Bromoil print, showing particularly the accents of light put in on the tower

good brand of one or other of them will serve the oil worker as what is known among oil-printers as a "soft" ink. The "hard" ink, of equal service in pigmenting the print, is represented by a litho' ink, some varieties of which are too stiff for oil work and require reducing down with a little pure medium such as painters in oils mix with their colors. A third class of ink, also to be had from the printers' supply houses, is that used by copperplate printers. Lastly come the artists' tube oil colors, which as a rule are too soft for "oil" printing, and (even the "stiff") are of service only, as we shall see directly, in saving a print which is much under-exposed. The best advice to be given to the beginner is to get a supply of two inks only, a hard and a soft, and stick to those alone.

Color of the Ink Although ink of any color can be made up for the oil process, there is very little to encourage one to depart from a good black, or, at any rate, to stray further than a sepia or a blue- or brown-black. The warmer colors go best with a paper of cream or ivory tint, whether by the oil or Bromoil process. The necessary touch of warmth or blueness may be given to a cold black by working up with *very little* of a brown or blue ink, but a very homogeneous mixture must be made; otherwise it is annoying to find after pigmenting that the color is not uniform throughout the picture. On the whole, it is best to stick to the ready-prepared inks rather than obtain variations of color by admixture. M. Demachy, if we are not mistaken, has done all his fine oil work in a black ink, and the results certainly leave nothing to be desired in respect of luster and richness.

Brushes We owe the brush technique of oil printing to MM. Puyo and Demachy, who took up oil with great eagerness and speedily developed the pigmenting part of it into an art craft. The best brush, it was shown by these workers, is the so-called "stag's foot" shape (French "pied de biche") of fitch hair (Fig. 2). The shape of the brush allows of quite a large brush being used for somewhat small areas in the print, as only the curved tip of the brush need be applied. A flattened brush is

useless in this respect. These brushes are doubtless obtainable from artists' supply dealers, though they are essentially French manufactures. In England, the "pied de biche" (French make) are sold by all the firms who have taken up "oil" requisites. M. Puyo has stated that those used by him are purchased from M. Bullier, 5 Rue Charlot, Paris. They are somewhat expensive, but fortunately only one or two are really necessary, one well-known English worker, H. W. Rennie, using the No. 14 for all purposes. Still, if a

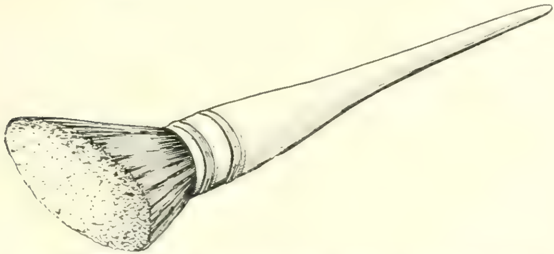


FIG. 2. The French "pied de biche" brush. The domed end allows of a large brush being used on quite small areas

worker is buying a full set of brushes, suitable for continuous work, he may be advised to follow Mr. S. L. Coulthurst's selection, and obtain of the stag-foot fitches, two of No. 14, two of No. 10, two of No. 7, and one of No. 5. In addition to these, one or two of the flat-ended pattern for use in larger or broader work. One or two small hard hog's hair brushes are also useful for taking off pigment, and so giving small light accents to the print. Brushes must be handled carefully, so as not to distort them, or they lose their natural dome shape. To clean them, they are dipped in benzoline or automobile petrol, or the noninflammable "Carbona."

Pigmenting the Print

The thoroughly soaked print, bearing its scarcely visible image, must be kept very moist throughout applying the ink. If it is not, the ink will take all over equally well. While the surface must be free from adhering water, the state of moisture of the print should be such that

An Oil Print, Partly Pigmented

the back is quite wet. To secure this over the considerable time, say, a couple of hours, which many workers will spend on a print, several thicknesses of stout blotting paper are thoroughly wetted, laid on a board and covered with one (or two) thicknesses of clean thin muslin. On this wet support the print is laid. If it tends to dry, it should be lifted off the pad, some water poured on the latter, and the print replaced.

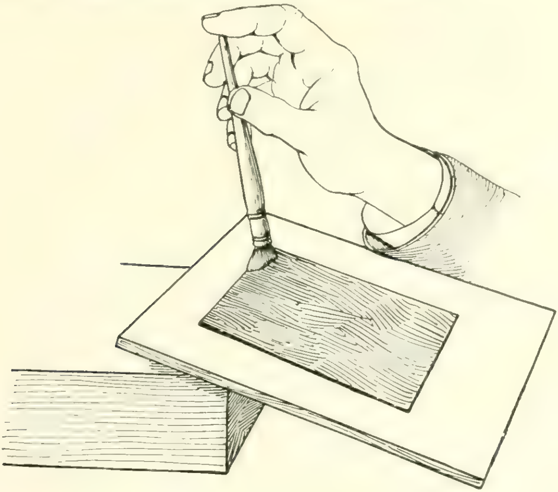


FIG. 3. Inking the print by dabbing. The print is laid on several thicknesses of wet blotting paper, on which is a cover of thin muslin.

The Technique of Pigmenting

The most difficult part of the process to communicate in words is the use of the inked brush in pigmenting the image. First of all, let the beginner learn to use the brush *lightly*. In M. Demachy's phrase, "oil printing is distinctly not an athletic pastime." It involves a delicate touch, but the precise description of "touch" is what must be learnt in practice. M. Demachy has put the principle of the touch into a few sentences: "Bear in mind that every application of the ink-charged brush is composed of two actions, each of

which produces an opposite result—the downward and the upward action—separated by a period of contact which we must admit is part of the first and downward movement. The first movement brings the ink into contact with the film. The second movement removes it wholly or partly. These two actions may be so balanced that no result will be perceptible, the ink applied by the downward action having been removed by the upward one. It follows that, according to the delicate pressure of the hand in applying the ink, and according to the varying elasticity of the wrist in removing the brush from its close contact with the film, varying quantities of ink may be applied or brought away."

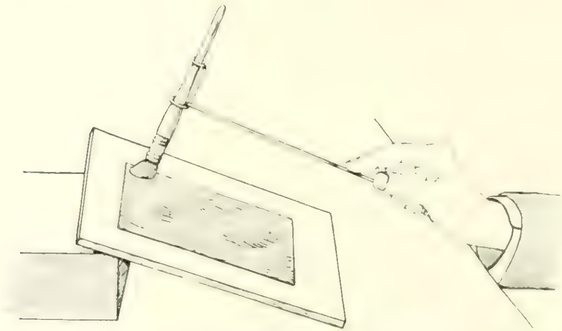
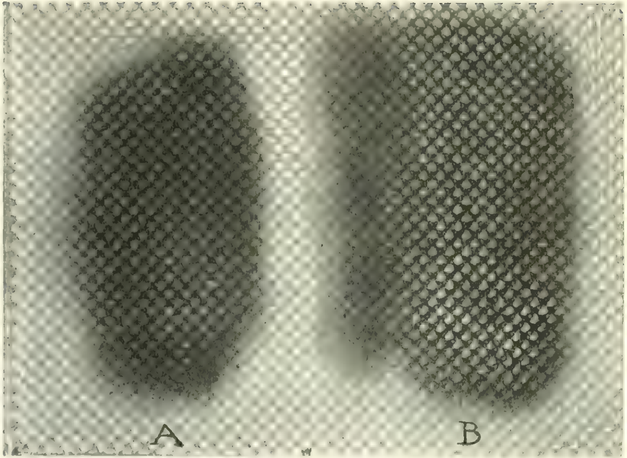
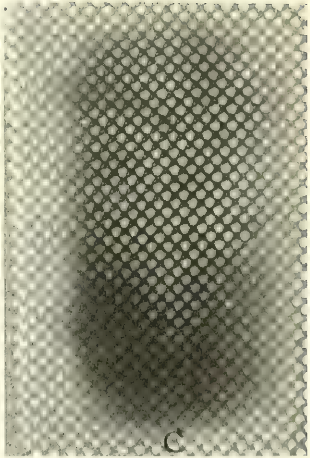


FIG. 4.—"Hopping" with the aid of a wire holder for the brush. "Hopping" can be done also whilst holding the brush in the fingers.

That describes the principle on which the print is pigmented. In applying it, individual workers will develop a "touch" which becomes second nature. In starting to work, we place before us a rough print of the subject as a guide to what we are doing, and apply a little of both the hard and the soft ink to different parts of a piece of Bristol board (the best palette)—a very small piece, which should be spread out flat on the palette, so that the ink will be taken up evenly by the brush. If the print has any drops of water on it, mop these off with a soft ball of muslin or a sheet of blotting paper.

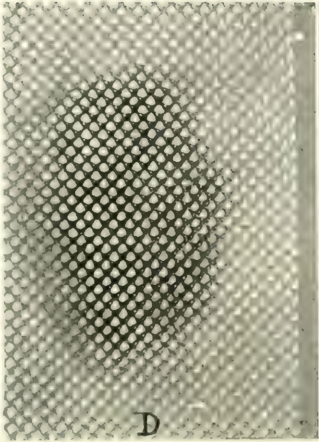




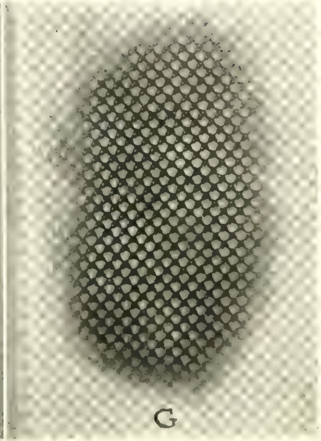
Medium ink; effect of first application by dabbing.

Medium ink; effect of further dabbing with same brush—ink removed from high lights to left, reversal produced at first inking.

Medium ink applied as in B. Upper part "hopped," clearing off ink and giving contrast. Lower part left "unhopped."



Medium ink applied first as in B, then "brushed" or "swept" removing ink from high lights.



Soft ink, applied first as in B. Then "swept," clearing from lights and depositing more in shadows compared with D.

From bromide print of original subject. Different portions of the same print (treated by the Bromoil process) were used for examples A, B, C, etc.

The print is first brought up light in all parts. We then see, from the guide print, which are the parts where most and least pigment is to go. The brush is held at the top, flexibly between the two first fingers and thumb (Fig. 3). It should not be grasped firmly, nor held down near the mounting of the hairs. Holding it thus lightly, almost loosely, the print is gone over with a small tapping movement, which deposits pigment in proportion as it is done leisurely, and removes pigment as it is quickened or made more "staccato." For enhancing contrast, this tapping movement will be combined with something of a dragging or sweeping motion, which helps to clear pigment from the high-lights and to increase it on the shadows. Such "sweep" or "swish," to use shop terms of the oil-printer, is of very small range, but is repeated over the area of the print which is under treatment. "Hopping" is another "touch" which removes pigment. It is simply very quick tapping, literally dropping the brush from an inch or so above the print and taking it up again quickly. A semi-mechanical method of producing the movement is to mount the brush on a piece of stiff wire about eight inches in length; the hand alone will then give this quick up and down movement of the brush by virtue of the spring in the wire. (Fig. 4.) But the "hopping" is, or should be, used chiefly for removing ink which has been too freely applied.

Illustrations of Touches The best means of getting an idea of the effect of these different methods of applying or removing the ink is to take for our subject a photograph of a pattern in which we can get both light and shade repeated uniformly over the whole area. For this purpose a wire door mat was photographed, and the negative purposely kept fairly soft so as not to give a print in black and white only. H is a direct bromide print from this negative. The other prints, A to G, for the pigmenting of which we are indebted to Mr. F. C. Tilney, show the various effects which can be produced by varying the method of using the brush.

A shows the result of first application of a medium ink to the attractive surface, in this case that of a Brom-

oil. B shows the effect of further dabbing—the light spots are somewhat cleared. To the left may be seen the reversal, which appears when first inking a print, but afterward disappears.

C shows the effect of "hopping" very lightly—clearing of the ink off the high-lights. The lower portion has been left "unhopped." D, prepared first of all as in B, has been subjected to the "brushing" or "sweeping" action. "Sweeping" cleans off the ink, which, according to its hardness or softness, may either leave the darks as well as the lights, or may accumulate upon the darks as the brush passes over them. The method gives a maximum of brilliancy.

G shows the effect of "sweeping" under conditions similar to those of D, except that a softer ink was used. Note the heavier deposition of ink on the shadows.

Using Hard and Soft Ink

In general we bring out the print with a hard ink, changing the brush as the portions of the subject require a fine application of ink or can do with a broader area of inked-hairs. Parts which fail to come up to the depth required may then be taken in hand with the soft ink; for what is under-exposure to the hard ink will be correct or over-exposure to the soft. The soft ink must follow the hard; it is impracticable to attempt adding hard ink to parts which have been inked in soft. The result is to remove the soft ink.

The richness which is characteristic of a good oil print will come with practice, if these general principles of inking be kept in mind. As regards advice as to where the shadows are to be increased and where the light-accents should be placed, neither practice nor teaching will tell the worker this, unless he has it in him to appreciate the value of these tones himself. But for his encouragement let it be said that, if his photographic print possesses some claims to pictorial qualities, a *little* use of the power allowed by the oil process will most certainly improve the result more than a good deal of "control." Some have written as though the impression from the photographic negative was necessarily altogether bad. Though the esthetics of the process are beyond the scope of this monograph, we must find space for one

more quotation from M. Demachy: "The purely photographic values of most straight prints are not all wrong; it is their relation to each other which is generally faulty. In many instances, only one or two portions of the picture will need darkening or lightening to a certain extent, which must be the proper extent."

Over- and Under-Exposure One of the questions which the oil worker soonest comes to ask himself is as to the correctness or otherwise of the exposure. The best test to bear in mind is that over-exposure means more active retention of the ink, hard or soft. An under-exposed print with a soft ink will give a result which, as regards contrast alone, is not very different from an over-exposed print with a hard ink. But the retention of the ink, say, in the half-tones, will be much more vigorous in the latter case, and that, as M. Demachy has pointed out, should be the final test of exposure. In the case of an under-exposed print, one stroke of a wet brush or wet muslin pad will remove the hard ink; but, with over-exposure, the soft ink under similar treatment will come away only with considerable rubbing, and leave the surface spotty. In general, however, the mark of over-exposure is flatness; a hard ink is the means of avoiding it. The mark of under-exposure is reluctance of the image to appear, with often a granular deposit where the ink can be got to "take;" the remedy in this case is a softer ink, or one softened by very minute addition of medium or linseed oil.

Hairs on Prints One nuisance of the pigmenting process is the persistence with which even the best brushes deposit tiny hairs on the print. On occasion, the labor of removing them when the print is done will be greater than that of applying the ink. One worker has advocated thinning the ink with petrol and filtering it through muslin, but the more practical way of getting over the trouble is that suggested by Mr. Harold Baker. Keep the supply of ink in a metal box with a tight-fitting lid, such as the tins in which shoe or metal polish is supplied, and for each print to be pigmented, take out a little of the ink for use and throw away any left over. If this be done, and if the brushes be well cleaned with petrol before start-

ing on a fresh print, there will be much less cause to complain of hairs on the finished prints.

Final Stage: Oil Printing

When the fully pigmented print has been judged satisfactory, it remains to pin it down on a board in a place as free from dust as possible until the ink is dry. That may require hours or days, according to the nature of the ink and the paper. When dry, some further light accents can be put in on the print by means of a piece of sharply pointed india-rubber eraser. To strengthen shadows, on the other hand, it is necessary to soak the print afresh in water until the relief is obtained, and then to do what is necessary with a soft ink. If it is thought that the general effect can be improved upon by beginning anew, the whole ink impression can be cleaned off with petrol, the print gone over with clean water and a sponge, and then re-soaked before commencing to pigment the print again.

Mounting Oil Prints

There is a temptation for the oil worker to hasten to mount his print before the ink deposit is fully hard. Depending on the ink and the paper, a print may not become so quickly fixed that it will withstand rubbing within a week. For framing immediately, the best plan is to attach to the mount by a touch of strong adhesive at the two top corners. Even greater precaution is necessary if the print is to be dry-mounted, for the heat of the press will fetch off large patches of the ink unless the latter has fully hardened; at least twenty-four hours should be allowed to elapse before mounting prints by this method. The Bromoil print is even slower than those by the "oil" process in reaching the hardened condition, owing to the less porous nature of the support. The factors most favorable to rapid drying in either case are moderate warmth and plenty of air. Some workers, on this account, use a drying cupboard of the kind commonly employed by carbon printers for drying tissue after sensitizing.

The Bromoil Process

In Bromoil we have a more rapid and convenient method of producing the oil print. The starting point of the process is a good bromide print, by contact or enlargement from

the negative. This print is bleached in a solution the basis of which is potass bichromate, is passed through an acid bath and is finally fixed and washed, after which it is ready for pigmenting. This is the procedure worked out by Mr. Welborne Piper, the inventor of the process, as first published in the "Photographic News" for September 6, 1907. It still remains as satisfactory and reliable a method of working as any, though several variations, further shortening the process or avoiding the use of the acid bath, have been introduced.

The Bromide Print

Most bromide papers of fine matt or semi-matt surface are suitable for Bromoil. Glossy papers are less favorable to pigmenting, and, in any case, the glossy surface is not one to be desired. Gaslight or slow development papers have not, so far, been found suitable for the process, apparently because of the presence of chloride in the emulsion. Among bromide papers, hardness of surface is an important consideration, as both the use of the acid bath and the pigmenting process call for considerable resistance on the part of the gelatine surface. Most leading brands of matt and semi-matt bromide paper have been found suitable. In the case of those of softer film, the avoidance of warm solutions, coupled with shorter time in the acid, will suffice to adjust matters, but it is dangerous to generalize in this respect. A bromide paper is specially made for the process by Griffins, London, under the name of "Bromoil." It is supplied in both smooth and rough varieties, and has a hardened surface which allows of vigorous pigmenting. An alum or formalin bath, in toughening the surface of the bromide print, has not been found of much use unless applied to the sensitive unexposed paper. Mr. Greenall uses a solution of formalin 1 part; methylated spirits (or Columbian spirit) 48 parts; immersing the bromide paper for half a minute and pinning up to dry. This preliminary treatment (which of course must be done in deep orange light) will enable the surface to withstand vigorous inking and may be adopted by those who experience trouble from the delicacy of the gelatine.

The most suitable developer for the bromide is amidol; metol-hydroquinone suits many papers, but for

An Ancient Town Wall
From a straight bromide print

some obscure reason the result of amidol development seems to pigment better. The best print is one with full detail everywhere, and without excessive vigor in the shadows. The pigmenting allows of extra depth of shadow being easily piled on with a soft ink, whereas, if detail in the bromide is faint or has been got out only by forcing development, it will be found that the most patient pigmenting will fail to bring it up. As in the "oil" process, results with richness and beauty demand a really good print, produced without tinkering, from a good negative. The print is fixed and washed in the ordinary way, and may be put through the Bromoil process forthwith, or dried and kept for a reasonable time before doing so. In fact, the hardening of the gelatine surface which then takes place is an advantage.

An Ancient Town Wall: By F. C. Tilney

Bromoil print, showing the massing of the composition and the balance given by the cloud worked in on the gelatine surface with the brush.

Treating Bromides for Bromoil

The bleaching solution worked out by Mr. Piper, and hitherto most commonly adopted by workers of the process, is as follows: Ozobrome stock solution,* 4 parts; Potash alum, 10 per cent solution, 4 parts; Citric acid, 10 per cent solution, 1 part; Water to make in all, 20 parts.

This is made up when required and thrown away after use, as it will not keep. Its bleaching action is rapid; in less than two minutes the black bromide

*As sold in U. S. by the Eastman Kodak Co.; in Britain, by Ozobrome Ltd.

image is converted into one of pale brown, and no good is gained by continuing the action of the bleacher after it is seen that all black has been thus converted. The bath can be used for several prints in succession, a useful rule being that the quantity of bath sufficing to cover a print may be used to bleach not more than six prints of the same size. The bleached print is now given a momentary rinse by lowering it into a dish of water and then transferred to an acid bath composed of: Water, 20 ounces; sulphuric acid (concentrated), 1 ounce. This bath should be made up in fair quantity beforehand and time left for it to cool, as the addition of the acid to the water develops considerable heat. And note particularly that the acid (measured in a graduate) must be poured *into the water;* if water be added to the acid, the action may be violent enough to splash the acid mixture about, and generate heat which will crack the bottle.

In the acid bath, the pale brown image almost completely disappears; a greenish image remains, but so faint that it is difficult to identify subjects from it. The acid should bring the image into slight relief, as may be seen by blowing a patch of the print surface-dry where a high-light comes against a shadow, which latter should show as sunk compared with the high-light. From two to five minutes is ample for the action of the acid, and the print is then given a few minutes' wash in water, and fixed for about two minutes (ample) in: Hypo, 2 ounces; soda sulphite, ½ ounce; water, 20 ounces; after which it is washed for a few minutes and is ready for pigmenting. This, as indicated on page 466, may be done at any convenient time.

A very essential point in the Bromoil process is to pass prints quickly through the operations according to a scheduled time, which should be approximately as follows:

Bleaching	2 minutes
Rinse	½ minute
Acid	5 minutes
Wash	5 minutes
Fixing	2 minutes
Wash	5 minutes

the whole process should not take longer than twenty minutes, and of course is done throughout in full light.

Some Precautions

The acid bath renders the paper very tender, and care should be taken in handling prints not to drag them with a jerk, causing creasing or stretching.

The solutions should be used at near about 65° Fahr., not colder than 60° or warmer than 70°. This applies particularly to the fixer and final wash with water, chilling of which is apt to create difficulty afterward in getting the print to pigment. In this respect Bromoil is quite on a par with "oil," except that the lengthy soaking which is necessary in the case of "oil" is not required with Bromoil. But the effect of a chilled wash-water is equally apparent in both instances.

The other source of trouble is one which it is almost impossible to remove, since it is the different, and sometimes differing, character of the bromide paper. Some papers will work best in cold weather, but give flat results in summer; whilst with others precisely the reverse is the case. And occasionally one hears of a paper which in winter requires solutions to be well over 70° Fahr., and yet in summer will not respond to the process if the baths exceed 60°, apparently the result of a change in the emulsion by the maker with the season. The moral for the beginner in the process is to confine his work at the start to a few papers, and select one of these which secures him good contrast in the Bromoil.

Pigmenting

The principles of applying ink to the Bromoil are not different from those which govern the "oil" process, except in so far that the Bromoil surface retains pigment more tenaciously than does "oil" and, therefore, the procedure requires it to be more tentative. A softer ink may be used in Bromoil than in "oil" as a general standard. Otherwise, everything already said of this part of the process applies equally to Bromoil. Brushes and inks are the same for both, and can be used intermittently for both without detriment. In both cases, too, the underside of the print must be kept wet during inking. And, lastly, the possibilities of going too far from the photographic base assail the Bromoil worker no less

than him of "oil." From the examples which are reproduced on other pages, the reader can judge for himself of the extent to which variations in tone, and even in drawing, may be introduced into the photograph.

Other Formulæ

So far the formulæ given for Bromoil have been those laid down by Mr. Welborne Piper at the time of his origination of the process. Since then, a number of workers have introduced modifications, several of which deserve to be mentioned, since in some cases they simplify the process and in others render it more generally available.

A Bromoil "Bleach" Formula

A very useful formula from which the bleaching solution for the process can be made up with chemicals to be bought at any drug store is the following, due to Mr. H. W. Rennie: 10 per cent solution potass bromide, 3 parts; 10 per cent solution potass ferricyanide, 2 parts; 10 per cent solution potass bichromate, 4 parts; hydrochloric acid (10 per cent solution), 3 parts; 10 per cent solution alum, 8 parts. The solutions are kept separately and mixed at the time of use. This bleacher is best used at a temperature of 75° Fahr., the print being then rinsed and passed through the acid and fixing bath exactly as already described.

Ozobrome Acid Formulæ

A bleacher which apparently amounts to very much the same thing as that just mentioned is made up as follows: Ozobrome solution as sold, 1 part; 1 per cent solution hydrochloric acid, 5 parts; water, 4 parts. The 1 per cent acid is made by adding 2 drachms (fluid) of pure hydrochloric acid (sp. gr. 1.16) to 25 ounces of water. In this bleach the bromide print becomes pale brown in from 1 to 3 minutes, and is then placed direct in a fixing bath of: Hypo, 2 ounces; ammonia, .880; 1 drachm (fluid); water, 20 ounces; where it is allowed to remain for from two to six minutes,—for the shorter time if it has bleached quickly (in about one minute), or for longer if bleaching has been complete in two to three minutes. It is then washed for a minute or two, and is then best dried and re-soaked for about twenty minutes, to prepare it for pigmenting. This process dispenses with the use of a separate bath, but if prints

From an Oil Print by S. L. Coulthurst, F.R.P.S.

The Old Bridge By S. L. Coulthurst, F.R.P.S.

From an oil print on rough surface paper to show

are pigmented straight from the wash water there is a difficulty in getting contrast. After being made bone-dry, the print gives contrast much better.

A further formula for use with the Ozobrome solution is one consisting of equal parts of the solution as sold and the following stock acid bath: Chrome alum, 180 grains; potass bisulphate (acid sulphate of potass, cryst), 60 grains; citric acid, 25 grains; water, 25 ounces. The chemicals are dissolved in 10 ounces of hot water and the rest of the water added cold.

Another Non-Acid Method

Quite a distinct method of dispensing with the acid bath has been worked out by C. H. Hewitt. The print, bleached in the standard ozobrome mixture (Piper's formula), is rinsed in several changes of water and placed in a solution of ammonium sulphocyanide (1 ounce), in water (20 ounces), which not only produces the relief but fixes the print. A brief final wash brings the print into a state of readiness for pigmenting.

A Rapid Method

Another departure from standard practice is chiefly of value when one is preparing a single print for pigmenting in the least possible time. The process, which is due to J. M. Sellors, consists in developing the print in amidol in the usual way, rinsing for a minute under a spray, and then (instead of fixing) placing the print, in its unfixed state, into the bleacher (Piper formula) warmed to 80° Fahr. to 90° Fahr. Bleaching is complete in from two to three minutes, the print is given another rinse for a minute under a spray and is then put in the acid bath. Once it is in the acid, white light can be used for the rest of the process, which consists only in a further one-minute rinse, fixing in the hypo and sulphite bath for five minutes, and a final wash for ten minutes, preparatory to pigmenting. In this way a Bromoil ready for pigmenting can be got ready within half an hour of exposing the bromide paper in the printing frame or enlarging lantern. And the process can be still further shortened by using the Hewitt sulphocyanide as a substitute for acid and fixer; but when this is done a larger proportion of citric acid, one and one-half to twice the quantity, should be used, otherwise the results are lacking in contrast.

Pigmenting Toned or Re-developed Prints

It will readily occur to those familiar with the toning processes employed with bromide paper (See THE PHOTO-MINIATURE, No. 103, Toning Bromide and Gaslight Papers) that the bleaching solution of the Bromoil process is one which may be used quite well in the so-called "sulphide" method of toning, and that the bleached image may likewise be re-developed in any strong and clean-working solution. Either of these processes can be applied to the print bleached in the Piper standard formula without affecting the powers of the image to attract greasy ink, and therefore we can, if we wish, apply the ink not to form the image but to supplement an image prepared in black or brown according to the darkening re-agent applied to it. A strong amidol developer is about the best formula with which to bring back the bleached image to full vigor. The only drawback to this method is getting an ink which is a perfect match with the image of silver (re-development) or sulphide (toning). Nevertheless, the method is a very useful means of introducing darker accents into the print, and a slight difference in color will be of no consequence when the purpose of the print is reproduction in the press; which is a reminder that at least one publisher of illustrated books in America is using oil prints, prepared for the purpose by a leading French worker, in the process.

Photogravure Effects with Bromoil

The ink image in a Bromoil print lies in intaglio—that is, is sunken below the level which marks the high-lights of the subject. The conditions of things is analogous to that in a photogravure plate, and in the case of the Bromoil, just as in that of the photogravure plate, we can apply a piece of plain absorbent paper and soak up the ink from the depressions in which it lies. Mr. C. H. Hewitt, who was the first to point out this fact, takes advantage of it to produce an impression resembling a photogravure. The freshly made Bromoil is placed whilst still damp on the bed of a copperplate press, placing under it a piece of card of the exact size of the plate-mark desired in the impression. Over the print a thin mask of paper is placed,—symmetrically, of

course, with the card below and showing the exact amount of the subject to be obtained. A piece of plate paper is now laid over all, and an impression pulled as in ordinary copperplate printing. The plate paper withdraws the ink from the Bromoil, giving a purely mechanical duplicate, reversed as regards right and left, but reproducing the tenal values of the Bromoil. There is no doubt that further use will be made of the inked intaglio image of the Bromoil print in photo-mechanical work, but meanwhile the above process supplies the means of preparing an ink impression on pure paper.

Acknowledgment

Cordial acknowledgment is here made of the help given by Mr. S. L. Coulthurst, of Manchester, of whose experience in oil and bromoil liberal advantage has been taken in preparing this monograph, and of whose mastery of the technique of the process we are glad to reproduce one or two examples.

To Mr. F. C. Tilney thanks are also due for the opportunity granted of showing the use which can be made of the latitude of Bromoil in the hands of a trained artist.

BOOKS

The Oil and Bromoil Processes. By F. J. Mortimer and S. L. Coulthurst. 1909. 50 cents.

The Sinclair Handbook of Photography, containing a chapter on oil, by M. Demachy, and on Bromoil by C. H. Hewitt. 1908. 50 cents.

Le Procédé Rawlins à l'Huile. By C. Puyo. Paris, the Photo-Club, 44 Rue de Mathurins. 1 fr. 50 cents. (On the oil process only, and a very comprehensive manual, in French, on the technique of pigmenting. A fair proportion of the text is translated in the "British Journal of Photography" for Aug. 30, 1907.)

The Bromoil Process is the subject of a lengthy paper by C. Welborne Piper in "*Photographic Journal*" for February, 1909.

The Oil Process is treated also very fully by John H. Gear in the same journal for March, 1909. (Copies obtainable at 35 cents each from the Royal Photographic Society, 35 Russell Square, London, England.)

Notes and Comment

With a keen sense of personal loss, we record the death of our old friend and co-worker, Dr. John Nicol, which took place March 13, at Clifton Springs, N. Y.

Born in Scotland in 1828, and taking up photography as an amateur in the early forties, Dr. Nicol was one of the few men of our day who possessed a personal knowledge of the development of photography from its earliest beginnings to its present perfection. In his boyhood he was apprenticed to the drug business, and it was doubtless his study of chemistry which turned his attention to photography. Be this as it may, we find him contributing technical papers to the "Photographic News" and other journals as far back as 1856, since which time his connection with the photographic press ceased only with his death—passing half a century of service. During his long and active life, he met and corresponded with many of the "grand old men" of photography, among them Sir David Brewster, Rejlander, Sayce, Russell, Hardwich, Woodbury, Warneuke, Dr. Vogel, Wilson, M. Carey Lea and others of equal note, of whom he would talk with lively interest when in the mood. Coming to America in the eighties, Dr. Nicol edited successively "The Photo Beacon" and "The American Amateur Photographer," both since merged in "American Photography," of which journal he was one of the editors at the time of his death. He was a born teacher, fluent, widely informed, and always interesting as a writer, frank in his criticisms, but sincere and kindly, and gathered about him a considerable following of enthusiastic workers to whom his word was gospel.

Dear Nicol, genial, virile, warm-hearted, full of fight and fun, abounding in good humor and brave spirits, and quite unspoiled by the generous affection of his innumerable friends: *requiescat in pace.*

Camera Adventures in the African Wilds: Being an Account of a Four Months' Expedition in British East Africa, for the Purpose of Securing Photographs of the Game from Life. By A. Radclyffe Dugmore, F. R. G. S. Pp. 233; 140 illust., 4to, $6. New York: Doubleday, Page & Co. London: W. Heinemann.

Quite apart from its interest to travelers and sportsmen, this splendid volume appeals peculiarly to amateur photographers, since it is primarily the record of a photographic expedition and abounds in information bearing upon the use of the camera in photographing wild game under difficult and often perilous conditions. Mr. Dugmore tells his story with all the enthusiasm of a sportsman who has learned that it is more exciting and much more satisfactory to stalk rhinoceri, lions and the like with a camera instead of a gun. Especially thrilling are the chapters which describe the photographing, at fifteen yards distance, of a charging rhinoceros, and the making of flashlight photographs of lions at less than twelve yards distance. A notable feature of the expedition was the use of the telephoto lens, and the examples of telephotography given throughout the book are among the most remarkable achievements thus far recorded in this field. Abundant details are given at every point concerning the photographic equipment and methods used, and the illustrations are notable for their technical quality.

The Twenty-fifth Annual Convention of the Photographers of the United Kingdom will, this year, meet at Scarborough, a charming resort on the east coast of England. The dates are July 4 to 9, Mr. Godfrey Bingley being the president for 1910. American visitors will be cordially welcomed.

Those who have known the uncertainties and failures of all ordinary devices for the igniting of flash powder in open or magazine lamps will appreciate the simplicity, certainty and unfailing efficiency of the A. G. F. A. Flashlamp (improved model) just introduced by the Berlin

Aniline Works, New York. The A. G. F. A. Lamp, which retails at the very moderate price of $1.75, has for its special feature a toothed wheel which revolves on touching a winding spring, thus igniting a metallic substance in the base of the flash-pan, and producing a stream of sparks at each revolution. The device is not affected by damp or climatic conditions, and is as simple in its operation as it is certain in results. The lamp can be operated in the hand or used as a stand lamp with a simple attachment. It is well constructed and has a neat nickel finish.

Under the title "Kodak at the North Pole," the Eastman Kodak Co., Rochester, N. Y., has published an interesting album of Polar pictures make by Anthony Fiala, Harry Whitney, Robert E. Peary and other arctic explorers. The text accompanying the illustrations is contributed by Mr. Fiala. Copies can be obtained from most dealers, or on request from the Eastman Kodak Co.

George Murphy, Inc., New York, advise us that they have taken over the American agency for the well-known Wynne Infallible Exposure Meters, and can supply these in any style promptly, with the necessary "refills" and accessories. We have also received from this firm a new, illustrated catalogue of Ross Lenses, which is especially interesting in that it gives an account of the origin and evolution of the Ross "Homocentric" Lens. This cataiogue and booklets covering the many imported specialties for which this old established house acts as American agent can be had on request.

We are asked by The Taylor-Hobson Company to announce that their series II Cooke anastigmats may now be obtained to order, with extension lenses somewhat like those furnished for the other series. By removing the front glass and substituting another, the entire focal length is increased. Thus, from the same point of view, the photographer obtains larger images

of distant objects. These extension lenses increase the size of image about fifty per cent; for example: an object taken with the normal lens, and two inches long in the photograph, is, from the same position, made three inches long with the extension lens. Better results are obtained than with the separate portions of other makes, practically two complete anastigmats being available. Present users should note that their series II lenses may be fitted with these new extensions, but the register number of the lens should be given with the order. Extension lenses for Cooke anastigmats other than the series II, have long been used, the back glass having hitherto been the one replaced. The series II are the only lenses which permit the change at the front.

Compact, well arranged, carefully illustrated, and covering all the needs of amateur and professional photographers, briefly describes the new catalogue just received from the Obrig Camera Company, 147 Fulton street, New York. The catalogue can be had free on application, and is well worth the postal card required to bring it.

The Photographers' Association of America held its executive session in Milwaukee during January to make the preliminary arrangements for the forthcoming Thirtieth Annual Convention of the Association. All the officers were present. The financial statement showed a cash balance on hand, January 1, 1910, of $6,483.22. It was decided to hold the convention at the auditorium in Milwaukee during the week of July 11. The school of photography, the non-competitive picture exhibit, the prize of $100 for the best invention, the congress of photography, and other special features, which were so warmly appreciated last year, are to be repeated at the next convention. It was decided to cöoperate in every way with the plans submitted by the Federation of Women Photographers, a branch of the Photographers' Association of America inaugurated at Rochester, 1909. It was decided to create a commercial photography sec-

tion, with a display of other features, which should bring new interest into the forthcoming convention Special stress was laid upon the fact that the 1910 convention will be conducted under the revised constitution and bylaws, which were adopted at Rochester, 1909.

Sculpture at Fontainebleau Palace
By George E. Brown
(See notes on the illustrations)

Staple Inn, London
By George E. Brown
(See notes on the illustrations)

The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT

Volume IX APRIL, 1910 Number 107

Hand-Camera Work

Put a hand-camera in your bag when going away. What reader of THE PHOTO-MINIATURE but has been applied to by some friend intending to take this advice of the advertisements. And what reader has not found it impossible to compress into an ordinary conversation the pros and cons of different descriptions of hand-camera and the knowledge which is essential to making good use of them. Simple as the matter appears to those who live their life among cameras and the other appurtenances of photography, the novice turns with confusion from "fixed focus" to "focal-plane" and "diaphragm aperture," and after an hour's discussion of the merits and demerits of patterns of cameras is very little helped. The present monograph is, therefore, written to do two things: to explain what is required of a hand-camera which may be relied upon to serve its owner well, and, secondly, to tell in as direct a manner as possible what are the chief methods of using a camera with the greatest measure of success. Thus our friends who are asked the vital question: What camera to buy? are thus provided with happy issue out of their distress—they have only to put this number into the hands of the enquirer and go their way, certain that they have done a good work.

Choosing a Hand-Camera Actually, in the present number, our object is a somewhat narrow one; and it is just as well we should define it at the start, and so save the reader unnecessary explorations into these pages, even though it is certain that the elegance of the literary style alone will repay the hour so spent. This monograph is not for the man who contemplates buying and using a camera of the reflector pattern, with its advantages of exact adjustment of focus and composition, and its inevitable drawbacks of bulk, weight and cost. For such as he, there is THE PHOTO-MINIATURE No. 99. Nor is it for the man who must have his camera of miniature pocket size, who places this consideration before any other, and is willing to pay the price in money (which is usually considerable), and in certain restrictions which such small cameras involve. The facts as to small cameras are set forth with all reasonable clearness in THE PHOTO-MINIATURE No. 97, and those for photography with the focal-plane shutter in No. 77. The present hand-book is for the would-be photographer, whose aim is at hand-camera photography, and whose means run to a sum of from seven to twenty dollars (30s. to £4). In what way may sums such as these be spent with advantage? What limits are set to the usefulness of the instrument by the lower price? What is the kind and the degree of skill which must be secured before one may count on a good average of success? These are some of the questions we will try to answer, and to put in a form which the beginner may readily understand. In doing this, we shall have occasion to deal with subjects which will probably interest and help those who have already a fair experience in hand-camera photography.

The Lens And so we will begin with frank inconsistency by declaring that the chief consideration in an outfit, and the one most directly responsible for the quality of the results, is not the camera at all, but the lens. The camera is but the cloak or hood under which the lens is permitted to cast the image of the subject on the sensitive plate. This is not simply a picturesque form of words: it is the hard, solid fact. The lens it is which decides the sharpness

and "clear-cut-ness" of the pictures; and this, quite apart from elaborate movements of the camera, saving only as these present the plate to the rays from the lens so that the latter is used to the best advantage. That is to say, the plate must be held strictly at right angles to the horizontal straight line (the axis) passing through the center of the lens. Now, we can pay any amount of money for a lens suitable for, say, a camera taking pictures of the 3¼ x 4¼ size,—from seventy-five cents or less, which is the price of a cheap single lens, to forty or fifty dollars, the price of an anastigmat of the most modern construction. So far as practical work is concerned, what is the material difference between these lenses? Well, to begin with, the main difference is in "speed," "rapidity" or, as is more correctly termed, "aperture." The aperture is expressed by the *f* number, and on this basis we can classify the lenses commonly fitted to hand-cameras as follows:

Single achromatic	*f*/11 to *f*/16
Rapid rectilinear	*f*/8
Anastigmat	*f*/6 to *f*/7
Anastigmat, large aperture	*f*/4.5 to *f*/5.6

These figures mean that the single lens makes it necessary to give five to seven times the exposure which is enough with the anastigmat of *f*/6 or *f*/7 aperture, and twice to four times the exposure needed with the rapid rectilinear. With the *f*/4.5 anastigmat, half the exposure required at *f*/6 will suffice. We can make the precise significance of these differences in practical work still more evident by giving the actual exposures which will be needed for an ordinary scene in good summer sunlight on a rapid plate. With *f*/6, this will be about one-fiftieth of a second, but with the other apertures the exposures will be:

Aperture	*f*/11	*f*/16	*f*/8	*f*/4.5
Exposure required . .	$\frac{1}{10}$ sec.	$\frac{1}{7}$ sec.	$\frac{1}{25}$ sec.	$\frac{1}{100}$ sec.

Now as 1-25 of a second is about the longest exposure which can be given when photographing a scene with moving figures in it, it will be clear that, in order to secure moving objects sharp and at the same time to

give the plate a full exposure, we require, even in summer light, a lens of at least $f/8$ aperture. Much more so, for work in dull weather or for later in the day, when, to secure the same action on the plate at the same shutter speed of 1-25, we are compelled to work at a larger aperture of lens: there is no other way to do it.

I shall have a word to say on this point again, but meanwhile I must pass on to mention the other chief difference between the four classes of lens for the hand-camera, namely, the character of the definition. In the case of the anastigmat, the image formed is of a finer or sharper kind and, though its superiority may not amount to much in the negative itself or in a contact print, it becomes very evident when enlargements are made. The rapid rectilinear is better than the single lens in this respect, but the anastigmat is the best of all, and is the lens which the user should aspire to possess on a hand-camera of however small or modest description. The cost of an $f/6$ anastigmat, which is the best all-round rapidity ($f/4.5$ is a less useful aperture), is not now so great as to put the lens out of the reach of people of modest purse. Rapidity is always worth its cost.

Differences in Lenses

The single lens of the dollar camera gives negatives which are remarkably good for such an inexpensive instrument, but it suffers from the defect of bowing or distortion of straight lines, such as those of buildings which come near the edge of the picture. The rapid rectilinear costs so little more than the single lens that the less expensive type of camera is fitted with it, and its aperture of $f/8$ is a good working speed, amply sufficient for ordinary work in a good light, and at a moderate speed of shutter. Ask any user of a large aperture anastigmat, and he will tell you that, for perhaps 50 per cent of his exposures, he stops his $f/6$ or $f/4.5$ lens down to $f/8$, and is often compelled to do so to secure depth of focus. Nevertheless, he values the wider aperture of his lens when he has to make the faster shutter exposures of say 1-100 to 1-250 of a second in good light, or when—and this is where the rapid lens is most often of service—he desires to make exposures at a shutter speed of say 1-25 second in badly lighted surroundings, or in the poor

light of winter or late evening. These newer lenses have made hand-camera work under such conditions perfectly practicable. But there is a limit beyond which this aperture cannot be usefully increased. For the average worker with a camera other than a reflex, I would put that limit at *f* 6. At larger apertures than this, the difficulty of making certain of sharp focus becomes so much greater that the extra speed of the lens is largely discounted by the frequent fuzziness of the results, due to error in the delicate operation of setting the lens at the right focus. Moreover, such large aperture lenses call for much extra care in shielding them from strong light, the result of which is to cause flatness or fogginess of the negatives. And, to prolong the list of contrasts by one more item, the very size of the lens (inevitable with a large aperture) restricts the rising front movement which can be obtained except in cameras of exceptional size.

Moral

Perhaps I can point the moral of all this best by relating an experience of my own in getting and using—using I say—a lens of the large-aperture type. For a certain service which I had rendered them, an eminent firm of lens makers wrote, begging my acceptance of *any* lens in their list. My feelings were those of the Cockney bar-lounger, who, meeting an old friend grown rich, was asked to "give it a nime." Prompted to indulge in an orgy of aperture, and regardless of the maker's warnings, I chose an anastigmat just then introduced of *f* 3.8. The first thing I found was that I could not buy a camera to which I could fit it. My infatuation would not be restrained even by this sinister sign, and I had a camera made to take my monster. In doing this I deliberately sought to provide a rise of front of two inches (it was for quarter-plate), and also a chamber at the rear of the instrument to enclose the Eastman roll-holder. The result exceeded my expectations—but only in the size of the camera. Kind friends admired my pluck in going in for hand-camera work with a *half-plate*, and as for my prized *f* 3.8 lens, I doubt if half a dozen plates were ever exposed behind all that full expanse of aperture: the majority were taken at *f* 6, or even *f* 8.

Good reader, be advised, and realize that in the matter of lens-aperture the useful limit for average work is reached at *f* 6. I have labored this point perhaps, but the beginner cannot afford to forget that the quality of hand-camera results depends chiefly on the lens,—the convenience and speed in getting them, chiefly on the other fittings of the equipment.

Shutters

Next to the lens, the shutter is chiefly responsible for the success or otherwise of hand-camera work. As regards its pattern, we have to choose practically between two—the "diaphragm," or "between-lens," and the "roller-blind" lens shutter. We can dismiss the focal-plane shutter as being somewhat too costly. Moreover, the very high speeds given by it are not of any real use in average work, and are of value only in making photographs of objects in extremely rapid motion, and, in many cases, it does not give the useful low speeds of 1-10, 1-8 and 1-4 second. The focal-plane, too, is more noisy, and, worst of all, more liable to get out of order, than any other type of shutter. For general purposes there is no real object in having it, and therefore it is far better to shun it. The roller-blind, although a very strong and efficient pattern of shutter is, I am afraid, too bulky to please most people. It is too big for fitting on most makes of folding camera; in fact, on almost any camera, it has to be carried separately and attached when it is wanted. For all that, the roller-blind is a more reliable shutter than most of those of the diaphragm type; its performance corresponds more nearly with the speeds marked on it, and if it should go wrong its parts are quickly got at, and any one with a small screw-driver and a little handiness can put matters right.

But in the shutters of the diaphragm pattern, the all-popular "Compound," "Ibso" and others, we reach the zenith of convenience, and if the user will acquaint himself with what these patterns of shutters actually can do (which is not always the same thing as the claims made for them), he can serve himself quite efficiently for all ordinary purposes. This applies in all every-day hand-camera work. For high speed work the multi-speed provides an excellent shutter of the diaphragm type.

Shutter Speeds

The first thing to get clearly into one's mind is that for the average range of subjects, street scenes, processions, animal studies, boating, and the thousand other subjects which are without rapid movement in them, an exposure of from 1-30 to 1-40 of a second is short enough, and often 1-20 or 1-10 of a second may be given. The second thing to be clear about is, that the markings of speeds on diaphragm shutters are conventional figures which do not indicate the actual speeds. The Bausch & Lomb Optical Company, the largest maker of these shutters, in their circular of the "Automat" shutters frankly avow the unsatisfactory character of such a "custom of the trade," and express their willingness to adopt a marking of actual speed. Will other makers likewise conform to the same practice? Until this millennium comes about, we must remember that the "hundredth" of the diaphragm shutter is more nearly a thirtieth or fortieth, and the "fiftieth" more nearly a twenty-fifth, while, as for the lower speeds, they are usually somewhat more rapid than marked. In other words, the top speed of the cheaper diaphragm shutters can be put at about an actual 1-40 second; and that of the more expensive, claiming to go up to 1-250 of a second, is actually a speed of 1-100 second, or perhaps a little faster on occasion.

Some Actual Shutter Speeds

In order to show that this condition of affairs as regards the speed of shutters is simply conjecture, some actual measurements of the times given one or two commercial shutters when set to the various speeds may be given. They are obtained by the apparatus devised by Mr. E. A. Salt, and described by him in a paper read before the Royal Photographic Society last year.

A good example of an old pattern of diaphragm shutter, medium price.

Marked speed	1	$\frac{1}{2}$	$\frac{1}{5}$	$\frac{1}{25}$	$\frac{1}{100}$	sec.
Actual speed	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{28}$	$\frac{1}{36}$	sec.

An expensive modern diaphragm shutter.

Marked speed . .	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{1}{25}$	$\frac{1}{75}$	$\frac{1}{100}$	$\frac{1}{150}$	sec.
Actual speed . .	$\frac{1}{6}$	$\frac{1}{12}$	$\frac{1}{26}$	$\frac{1}{68}$	$\frac{1}{100}$	$\frac{1}{125}$	sec.

In the case of another high-class diaphragm shutter, the actual speeds corresponded fairly well with the markings, with the exception of the hundredth and two hundred and fiftieth, both of which were practically the same, viz., about 1-120 of a second.

What Speeds Are Necessary The very cheapest hand-camera gives us one "instantaneous" speed, usually from 1-20 to 1-30 of a second, and, as I have said, amply sufficient for getting sharp pictures of subjects in which there is moderate movement, such as persons walking, and such like. But in hand-camera work we have to consider something else than getting the subject sharp on the plate; we have to look to getting the plate fully exposed, and it will often happen that, with the small stop with which the cheap-camera lens is fitted, 1-30 of a second is too short a time for the full exposure of the plate. We need to be able to give a tenth, which is a time short enough for plenty of subjects (those in which the moving object is a good distance from the camera) as regards sharpness, and long enough to permit a full exposure of the plate. That is why a moderate range of shutter speeds is a valuable means of securing a better average of results. 1-10, 1-20, 1-30 or 1-50,—if my shutter will give me these, I do not grumble. Few of us can hold the camera steady enough to allow of a longer exposure than 1-10, and the top speed of 1-50 of a second is really rapid enough for average subjects.

"Bulb and Time" On a later page, I invite the reader to subscribe to the doctrine that a hand-camera is often a good deal better when it is not a hand-camera. I hope the reader will follow me in this, because it is a point which means a good deal in the way of practical success. To put it in other words: With the lens and shutter of the cheap camera, it often happens that the plate does not get all the exposure it needs. Giving it the full aperture of *f* 8, say, and a shutter speed of 1-10, there will be many subjects which are yet under-exposed. Examples: avenues of trees, shaded streets, not to mention other subjects in bad light. The way out of this difficulty is to find a support for the camera and to give a longer

The Friend of the Family
By George E. Brown
(See notes on the illustrations.)

On the Way to the Festival

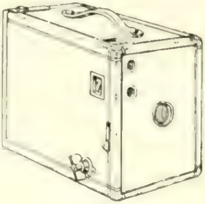
By George E. Brown

(See notes on the illustrations)

time. The "time" and "bulb" adjustments of the shutter allow us to do this. With the shutter set to "time," exposure commences on pressing the trigger or release, and finishes on pressing it again; with "bulb" the exposure continues as long as pressure is preserved on the trigger. The "time" is best for exposures of longer than, say, five seconds; "bulb" for shorter than this. An "on-and-off" touch of the release with the shutter set to "bulb" will give an exposure of about one quarter of a second, and from this point onward we have a range of times which are very useful when the "instantaneous" exposures mean an undertimed plate. Not only this, when a time exposure is given, a much smaller stop may be used in the lens and greater sharpness in all parts of the subject secured. But the camera must be held firm while making the exposure—of which later.

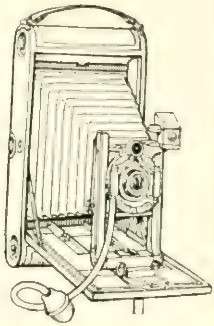
Matters of Choice

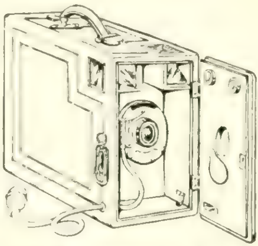
I must thank the reader who has borne with me amid the foregoing dry dust of principles. Let me assure him that the considerations as to lens and shutter are more vital to success with the hand-camera than the other "features" of a camera, though I am afraid purchasers will never be persuaded from basing their choice largely on the appearance and neatness of the apparatus. Still, I hope to have made it clear why certain facilities as regards lens and shutter mean a better return of successful results. The rest is largely a matter of choice. I cannot decide for the reader whether he shall use roll-film in the form of the daylight-loading spool (with its readiness of machine development) or in that of the equally convenient film-pack. If he is all for lightness and for making as many exposures as he wishes, then a film camera will be his choice, unquestionably. If he puts less cost as a prime consideration, if he is ready to dispense with facilities of re-loading, and snaps his fingers at a few pounds' weight, then plates will be his choice. In either case, he will be well advised to purchase the most rapid he can buy, and, in this respect of speed, plates offer an advantage. The point is not so important, after all, since many film-cameras can also be used with plates, and most plate-cameras will allow of the use



A. Fixed focus box camera for roll film, selling at $1 to $2. Quite efficient for average subjects in good light and favorable conditions, but lacking rising front and other movements required for special or difficult subjects.

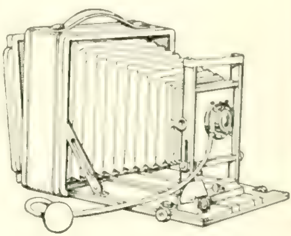
B. Focusing camera for roll-film, probably, in such forms as the Eastman F.P.K., the most popular of hand-cameras.





C. Box camera for plates held in a magazine at the rear — chiefly popular in Great Britain. Made in fixed focus and focusing forms and selling at $5 to $12. Limited in efficiency and capacity.

D. Focusing camera for plates or film pack. A very efficient type for hand or stand use and for all kinds of subjects. Has a fairly wide range of movements and has largely supplanted the box form shown above. Examples: Premo, Seneca, Sylvar, etc.



of the film-pack; so that one can turn from one kind of material to the other as circumstances render advisable. This does not apply, of course, to the very cheapest cameras which are for one or the other, but not both. Similarly, the preference for a box or folding pattern is chiefly a personal one. As in the case of the materials, there is practically no difference in the results.

Size of Camera As regards size, something else than mere preference for 4 x 5 over postcard, or for 2½ x 3½ over either, has to do with the matter. Other things being equal, the shorter the focal length of the lens, the easier it is to take properly focused pictures in the hand-camera. The advantage is all on the side of the short-focus lens, which means, of course, the small picture. "Depth" (by which we mean the distance in a straight line away from the camera within which objects are rendered sharp on the plate) is greater, the shorter the focus of the lens; but there is another factor which limits the degree to which we can usefully go in choosing the short focus, and that is the necessity of ensuring a very exact and flat position of the plate or film at the back of the camera, when using a lens of very short focus, say two inches. The net result is that a camera taking such very small pictures, if it is to be fitted with a lens of fairly large aperture, such as *f* 6, needs to be quite an instrument of precision to be really satisfactory, and the price is according. In short, the largest hand-camera which the reader is advised to consider is 4 x 5, or post-card (3½ x 5½) size,—the former, with a lens of six-inch, the latter with one of seven-inch focus. These are the largest two sizes which are really of service as hand-cameras of the ordinary kind, but a better choice is the quarter-plate (3¼ x 4¼), or the 2½ x 3½ or similar size, of which many hand-cameras both for plates and films are now made. The lens for the quarter-plate should be five inches, and that for 2½ x 3½, four inches focus. As we have said, much greater depth is secured with lenses of shorter focus, and so the failures from misjudged focusing are largely reduced. And as most of these small negatives are used for making enlargements, the smaller size is at no disadvantage.

Focusing and Fixed Focus The phrase "fixed focus" has a comfortable sound in the beginner's ear, suggesting sharp pictures without the necessity of focusing to get them. In a sense, the phrase does not misrepresent a camera of this class; but, let the beginner understand exactly what it amounts to when he gets out of the store. In the "fixed-focus" camera, the lens is permanently fixed in the front, at such a distance from the plate or film that all objects from the furthest distance up to within a few feet (8 to 15) of the camera are in sharp focus. Therefore, all one has to do is to see that the principal object is not nearer than this minimum distance, which, be it noted, depends on the focal length of the lens and the diaphragm used. To secure such a result in this way which will be really useful,—say a minimum distance of ten feet,—a lens of say four and one-half inches focus must be stopped down to *f* 16. That is to say, we pay in reduced aperture for the automatic character of the manipulation. With the sun always in full brilliancy and the subject well lighted, the fixed-focus camera is as efficient as any. It is when Providence withdraws her smile that the owner of the fixed-focus camera knows that the plate or film will most probably be under-exposed unless he takes advantage of a "time" shutter movement. What we have just said applies to the cheap fixed-focus camera, that is one fitted with a single lens of about three and a half to four inches focus and working at *f* 16. There is the other type, in which an equal degree of depth is secured by using a lens of *f* 6 aperture, but of much shorter focal length, about two inches. Such cameras, as mentioned in the previous paragraph, are usually very costly (those that are cheap are not much good), and the metal used in their construction to obtain rigidity makes them heavy. The reader is referred to the paragraphs in THE PHOTO-MINIATURE: No. 97 on the Verascope, Block-Note, etc., which are examples of this excellent, but expensive, fixed-focus type of instrument.

Given a bright light, the cheap small-aperture kind of fixed-focus camera is not by any means a toy. In the hands of the beginner, it will usually give a larger per-

centage of good results than is obtained as a rule by a novice with a better instrument. This is simply because the fixed-focus principle leaves no room for individual judgment (and error) in focusing the subject, demanding only that nothing shall be attempted within the "minimum distance" for that camera.

"Focusing" Cameras

The reason of the superiority of a camera in which the lens can be moved to and fro from the plate when "focusing" objects at different distance is twofold: a lens of larger aperture (greater speed) can be used, and also one is not tied down to a particular make or focal length of lens, but can choose. With the fixed-focus, the camera built for a given lens is a fixture, but in the focusing camera we can change the lens or fit one we already have, and (according to the extent to which the front of the camera can be racked from the back) can use lenses of different focal lengths. Though a longer focus is convenient at times for obtaining a larger size of the picture image on the plate for a given distance from the subject, yet the beginner will be well advised to stick to a lens of the normal focal length, for a plate of given size as stated in a previous paragraph. Let us explain the reason for this.

Focusing by Scale

With any hand-camera (except a reflex) we cannot see the actual image to tell if it is sharp. We must hold the plate in readiness for exposure, and must get the lens at a point in which it will give a sharply focused image of an object at three, four, five and six yards. This is done by providing a graduated scale on the fixed part of the camera and a pointer on the moving part, which pointer sets exactly across the mark corresponding with the distance of the chief part of the subject. It is here that we set our finger on the vital point in all hand-camera work (other than that with a reflex)—this judgment of distances. Obviously judgment is a matter of aptitude, skill and practice. It can never be invariably exact, and therefore it behooves us to make the working conditions such that any mistake is without serious effect in the sharpness of the picture. The two chief helps toward this safety are a small stop in the

lens and a short focus of lens. The small stop we cannot do with as a rule, else the full exposure of our plate suffers: the short focus of lens, as we have said, gives us this margin of useful depth up to a point, and therefore the less we exceed the focal length which will cover the plate the better for the average of results. For these reasons the "double extension"—the means of using a long-focus lens—is chiefly of service when the hand-camera can be used on a stand and the picture image actually focused in the ground glass.

Focusing Scales

The focusing scale of the hand-camera can take several forms, some better than others. The oldest and most primitive is a plate on the baseboard marked with the series of distances, the lens front being pushed or racked so that a pointer is brought opposite any given mark. Usually most cameras to which this form of scale is fitted are provided with an "infinity catch,"—that is, the lens front, on being pulled out, snaps into place with the pointer opposite the scale marking, meaning that objects in the far distance are in focus. This method has been further extended in usefulness by making the catch adjustable. It can be set so that the front, on being pulled out, snaps into focus on objects three, four, five or six yards distant, according to the setting. In practical work this is a great advantage; when one is taking figure studies, for instance, when a distance of five yards is about right, it is very handy to be able to open the camera to this focus without having to look at it, and so attract the attention of the subject to one's operations.

Another form of focusing scale is the "focusing mount" of the lens. An outer tube is provided for the lens barrel, which latter is moved to and fro in it by a lever or milled head on the front. This type of mounting does not readily admit of a diaphragm shutter being fitted; it is used almost exclusively with the focal-plane shutter. (See THE PHOTO-MINIATURE No. 77.)

Another form of scale is different in principle. Instead of increasing the distance from lens to plate when focusing near objects, the glasses of the lens are moved apart, so that the focal length of the lens is reduced, and thus the *same* distance of lens to plate serves to

render a *nearer* object in sharp focus. This is probably the most compact of all focusing movements, but it is not adaptable to all types of lens, nor readily to a diaphragm shutter. The best example of it is the well-known "Cooke" focusing lens.

Setting the Focusing Scale

Care simply, not skill or practice, is needed in setting the camera at a given focus. In some instruments, for example the Kodaks, fitted with the focusing lock, there is no call even for care, since the lens front is caused to snap at one point or another, but not in between. But, when the lens is racked continuously along from one mark to another, care must be taken that the pointer (or the tiny bar which crosses the scale) is brought right against the figure denoting the distance of the object. If the pointer or bar is a little above the graduated scale, it is easy to be a little "out" by not looking down from directly above. By looking from a point to the rear, the pointer is seen opposite a number farther along the scale. Makers should (and usually do) put the pointer or index quite close against the scale, so that a mistake of the kind cannot be made; but the caution is necessary with some cameras.

Clearly, if means can be devised whereby the divisions on the focusing scale are caused to be further apart, there is less liability to make a mistake, and the camera is more rapidly manipulated. One way of doing this is to attach the pointer to the shaft of the focusing pinion, and set the scale in a circle over which the pointer thus moves like the hand of a clock. But this can be done readily only with a camera having a flat, solid side (box pattern), and few of these even are fitted with a scale of this pattern, for no other reason apparently than that makers aim at the utmost unobtrusiveness and freedom from projections. Several of the box patterns of Kodak are fitted in this way, and an excellent plan it is for every-day convenience.

The Depth Scale

A further variety of the focusing scale is one which serves to set the lens at focus for a given distance, but, at the same time, indicates how far in front and behind an object at that distance sharpness is secured, and also to

what extent this area is increased by using a smaller stop. Fig. 1 shows the idea. The usual scale of distances is fitted with a second scale of diaphragms instead of with a pointer only. Thus, in the example reproduced, which is for a lens of five-inch focus and $f/6.8$ aperture, the depth at $f/8$ is from eight to thirteen feet; at $f/16$ is from six and one-half to ten feet, and so on. First worked out by Mr. Welborne Piper in 1903, this depth scale is embodied in the Beck "Cornex" index, and is fitted to many hand-cameras both of American and British manufacture. Its usefulness is chiefly by way of showing at a glance how far it is necessary to stop down the lens in order to obtain objects relatively near to and distant from the camera in focus; which means, in most cases, that the camera requires to be mounted on a stand in order to give the longer exposure necessary. Under these conditions, the depth index is a most valuable and rapid means of using a smaller stop to the best advantage, without going to the trouble of actual focusing on the ground glass. It forms another argument for carrying a light tripod, on which to use the hand-camera when the subject calls for a small stop.

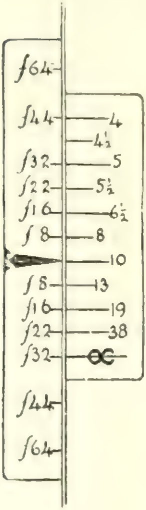


FIG. 1.

The Hand-Camera in Use

Well, now, after all this advice on what the hand-camera should and should not be, let us suppose that the reader is setting out with the instrument of his choice. Except that it is supposed to be one of the focusing type, we will not make any assumptions as to its pattern or fittings; of these we will learn something as we go along. What are the two first essentials to obtaining a successful lot of exposures? or, in other words, what are the most common causes of failure? On this question I am cordially in agreement with Mr. James Sinclair, perhaps as skilful a hand-camera worker as there is, and one,

moreover, with extensive opportunities of seeing the failures of others. In a paper before the Royal Photographic Society about a month ago, Mr. Sinclair put down the three chief causes of defective hand-camera work as: (1) Not holding camera steady during exposure. (2) Using too fast a shutter. (3) Misjudging the distance of the object. Some (the present writer among them) may not place these errors in the above order of importance, but all will surely admit that, given a good lens and a light-tight camera, the above are chiefly responsible for results with the hand-camera falling short of anticipation. Let us endeavor to help the reader with regard to Nos. 1 and 3, the effect of both of which is a fuzzy or unsharp photograph. No. 2 is quite distinct in its effect, causing under-exposure of the film or plate.

Holding the Camera

One has to learn to hold the camera steady while making the exposure, and proficiency in this respect is the more necessary the slower the speed of the shutter and the lighter the camera. As full exposure of the plate means a shutter speed of 1-20 to 1-40 second, and as the general preference is for a light folding camera, it is necessary to give attention to this point.

First, it is necessary to press the camera firmly against some support. If a post, fence, tree or angle of wall can be found, all the better. If one is not near such aids, then the body is used. Just where the camera ought to be pressed against one's person depends on the subject. If very near, and rather low down, e. g., a figure or animal, the camera ought to be held level and low down, not pointed downward. For this purpose, one knee may be placed on the ground and the other caused to form a supporting table. For average subjects, the waist level is most convenient, and

FIG. 2.

here a great aid is to sling the camera by a light strap going round the neck, and to keep it steady by a slight downward pressure. Pressure of the camera against the chest is, again, a good position, whilst a very firm support is secured by pressure against the chin or lips. Bear in mind that one can overdo the pressure business; pressure can be maintained so tightly that it becomes almost convulsive, and defeats its very object. Just press the camera firmly, but with some elasticity, and make a habit of holding the breath for the instant of exposure. All the better, too, if this instant comes when the lungs are deflated.

Finders In thus advising where to hold the camera, we must take into account the finder in which the picture is seen. True, our low viewpoint should be adhered to for near objects, and it is a mistake, therefore, to hold the camera against the chin and point downward. Yet, perhaps, the finder compels this wrong method. With a finder of the direct-vision pattern (Fig. 3), the camera has to be held so that the eye looks straight through the finder, which is therefore useless when the camera is held low down. The writer is prepared to advise a large finder of the direct-vision pattern against all others. He uses one about one and one-half and two inches; but for figures, etc., at a short distance from the camera, one has to employ either the brilliant or the ground-glass pattern, which are miniature cameras, and differ in this respect: the "brilliant" gives a bright picture, but many of them must be looked into from just the right point, otherwise they deceive as to the subject included (the best patterns do not deserve this criticism), while the "ground-glass," though the picture is fainter, can be looked at from any point. I like as big a finder as I can use on the camera and, as I do so myself, I would advise

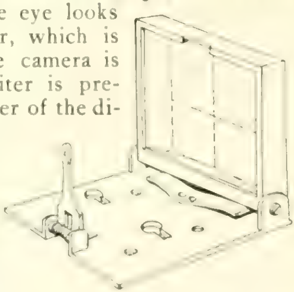


FIG. 3.

In the Pig Market
By George E. Brown
(See notes on the illustrations)

Striking a Bargain
By George E. Brown
(See notes on the illustrations)

the purchaser to fix the camera somewhere where it can be left without moving, expose a plate, and then compare the negative with the picture in the finder. If the latter shows less than the negative, well and good, we are on the safe side; but, if it shows more, is should be masked down with black varnish or a little gummed binder, as a safeguard against missing part of the subject in the negative.

Judging Distances

Next to holding the camera steady, the important thing to learn is to judge how far the subject proper is from the camera. In doing this, a little system will help one to become proficient much more quickly than if one simply aims at "dropping into it." The best way is to practise with set purpose the judgment of the distances which are of most frequent use in hand-camera work. These are: twelve yards (for general views where the principal part of the subject is about this distance, and no object is very near); eight yards (useful for vehicles, animal studies, etc.); six yards (for single figures and small groups); four yards (for figure studies on a larger scale, or similar near subjects). This is a fair range, and corresponds with the marking of most focusing scales, though makers usually give the figures in feet with, in many cases, an extra scale marked in meters. As Mr. Sinclair has always advised, it is best to think and judge in yards, for the reason that one somewhat lengthened stride is almost exactly a yard, and that provides one with a ready means of marking off distances. When the metric scale is fitted, one can take the meter as practically equal to the yard.

Now to set about practising the judgment of, say, the four, six and eight yards. The twelve yards is easier, and, as depth is greater, in this case there is less need to be exact. Never mind whether you have your camera with you or not; while on a walk or on the way to business, pace off from some object, say, eight yards. Take a look back and endeavor to size up the distance in your mind. Repeat the process a few times in different places, and then (still with the same distance) try your skill by stopping at a point which you guess to be seven or eight yards from some object, and then pacing

out to the object, to see how near you can judge. In this way, stick for a few days to your eight yards, until you can be sure of it, then practice the six and four yards in the same manner.

Judging Distance by Size

To be sure of sharply focused pictures, one needs to go through a little training of the kind just described. Believe me, good reader, it will pay you to do it. It is less necessary, of course, as the lens in use is stopped down, and a reflex camera dispenses with it altogether; but, for average work with the *f*/8 or *f*/6 lens, it is the only really practicable way. Of the many easier methods which have been proposed I will mention only one. It is based on the different sizes which an object appears in the finder when at different distances. If we could ensure an object of invariable height appearing in every scene, the method would be absolute; but we have to take a man of average height (say five feet six inches), and be content with that. We get a friend of this average height to pose at, four, six and eight yards from the camera, and mark the height of the image on the finder in each case by lines marked with the distance. Then, when a figure appears the height corresponding with the distance between a pair of lines, we are given a pretty fair indication of the distance, and can

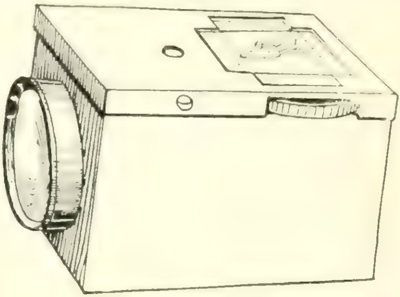


Fig. 1.

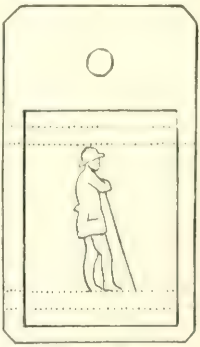


Fig. 2.

set the focusing scale accordingly. In carrying out the method, the glass of the finder itself (Fig. 4) may be ruled, or the marking made on a small piece of celluloid attached to the finder by a single screw, so that it is swung out of the way when not required (Fig. 5). The device is chiefly useful for figure studies.

Making Exposures

Let us assume that we have obtained some skill in these two first essentials—holding steady and judging distances. Our promised excursion with the camera has been delayed, but all the better for our results. We will set out again, and use what we have learnt on several subjects. Take one which stands at the door of almost every one—the view of a street, or some fairly tall building a fair distance off. Here there will usually be no prominent object in the immediate foreground. Set the focus at twelve or fifteen yards, hold the camera as level as you can, and look in the finder. Most probably you will see an expanse of foreground, with the essential part of the subject high up in the picture, and the tops of buildings in the middle distance cut off by the top edge of the finder. You will find that this is put right by tilting the camera upward. This removes the excessive blank foreground and gives a better place in the picture (more in the center) to the chief buildings. All the same, if it can be avoided, the camera must *not* be tilted; for the effect is to cause the true vertical lines of the subject to appear leaning toward each other. That may not be very noticeable in the little finder picture, but it will be quite pronounced on the negative. Instead, keep the camera level and raise the lens front on its uprights, or by any means provided in the camera. The finder will still show the excess of foreground, but on the negative this will not be so. How to tell the extent to raise the lens? That is a matter of learning to know your camera. In some few (and costly) cameras the finder does show automatically what is happening to the picture on the plate, but with most low-priced cameras one must learn to guess correctly from the amount of foreground seen in the finder how much to raise the lens. An inch rise with a five-inch lens in a $3\frac{1}{4}$ x $4\frac{1}{4}$ plate is a good deal,—as much as

can be used in a hand-camera with reasonable certainty of placing the subject. Try half an inch, if the foreground seems to need cutting off, and note the result. In making the exposure, give a gentle, steady pressure on the trigger, and *at once* put a new film or plate into position for exposure.

The Tilting Finder

In thus writing of the difficulty of knowing what is being recorded on the plate when the front is raised, I must not pass over the very practical and simple method, originated, I believe, by Mr. James A. Sinclair, and fitted to most of the hand-cameras of his firm. The finder of the "ground-glass," or "brilliant" pattern, in place of being fixed solid to the baseboard of the camera, is hinged to the latter, so that it can be tilted upward, a scale being provided showing the amount of tilt. The finder is hinged stiffly, so that it stops where it is set. Close to it, on the baseboard, is placed an ordinary circular level. When ready to expose on, say, a tall building, one holds the camera horizontal, as shown by the level. In the finder there will therefore be seen the excessive foreground and the cutting of the tops of buildings. Now, whilst still holding the camera level, tilt the finder until the picture desired is seen in it, note the degree of tilt on the scale which is necessary for this, and then raise the rising front to the mark of the series upon it (previously made to correspond with those of the finder tilt scale), still preserving, of course, the level of the camera. While not involving any mechanism whatever which can get out of order, this method is perfectly accurate and satisfactory in use, and enables the worker to avail himself of the great rise of front afforded by such cameras in large use by the British workers as the Sinclair "Una," the "Sanderson" and the Thornton-Pickard "Ruby," instruments which are somewhat more elaborate patterns of the type of hand-stand instrument represented by the Eastman Premo and Century cameras.

Level and Finder

Although it is better to hold the camera always level, the effect of tilting either upward or downward is marked only when there are buildings, pillars and other vertical lines in the picture. With landscapes and other subjects

in which these straight vertical lines do not occur, tilting is by far the lesser of two evils, and lens and finder then correspond as to the subject on the plate. But, even if one is obliged to tilt the camera in order to get a tall subject on the plate, the lean-to of the lines can still be remedied, when enlarging from the negative, by tilting it and the sensitive paper toward each other. This supplies a perfect correction but, naturally, it does not add to the ease of enlarging, as a small stop is necessary in order to secure sharpness.

Nearer Subjects

Assume a subject at rather closer range—the corner of a courtyard, a group of figures in a market. Here we shall require a distance of about six or eight yards. We set the lens at focus for the distance (judged by the eye) and, with the camera held down by one's own side or behind the back, we reconnoiter the subject, keeping at about our seven yards distance. Do most of your sizing-up of the subject (considered pictorially) thus, not in the finder. When you have decided on a suitable standpoint, bring the camera quickly up into position, hold it firmly and, while taking a rapid look into the finder, make the final selection of the picture. The next instant make the exposure, and move on as though you were engaged in nothing particular. The actual use of the camera need occupy only a few seconds, your operation will be almost unnoticed, and your pictures will thus be largely free from the signs of the presence of a photographer. Again, as soon as out of observation, change the film or plate in readiness for the next subject.

Moving Subjects

In these two examples we have assumed that the subject proper has not been a moving one, or at any rate that, though it may not have been perfectly still, it remained much about in the same place. The case is different when the chief interest of an exposure centers in a figure, or vehicle which is moving toward one. What is the best procedure under these conditions? The reply is that, saving the speed of the shutter (which now has to be fairly quick whatever the light), the procedure is exactly the same as before. We must decide at what distance the object is to be from the camera at the in-

stant of exposure,—in this we are guided by the size of the moving object. We set the focus to this distance and, making a note of some stone or mark in the roadway or sidewalk, wait for the object to come thus far toward the camera before pressing the trigger. It takes some while to describe this preparation for exposure, but it is the matter of a second or two to do. Using a lens of the focal length usually fitted, the distance will be about six yards for figures, eight to nine yards for vehicles. Here the release of the shutter calls for yet a little more experience because, quickly as one may act on seeing the subject come up to its appointed spot, the finger, nevertheless, lags a little in giving effect to the decision of the mind. That means that one needs to expose a shade in advance of the subject reaching the spot focused upon. With slowly moving figures—people walking, "crawling" vehicles, etc., this lag does not amount to anything, but, with objects in rapid motion (for many of which a focal-plane shutter is necessary), it has to be reckoned with. I have dwelt on these details of snap-shotting moving objects because apparently the beginner gets the idea that the method is to keep on adjusting the focus of his camera as the object approaches. Even with a reflex camera where the image can be actually seen and focused, I have never been successful on this system, and I have never found any one who was. No, the only plan is to make up your mind where you are going to take your subject, put yourself at a suitable distance (with focus set according), and await the turn of events.

Fallacies of Shutter Speed

As already pointed out, for moving objects the exposure has to be as short as the movement of the object demands; and this often means that it cannot be so long as the plate requires. If we humor the plate, we take the risk of fuzziness of the moving object; if we consider only the movement of the object, we have to prepare for under-exposure of the plate. Up to a certain point we can go some way in this latter direction, content with a half or even a quarter of the time which we should judge necessary for a really full exposure. In certain conditions, this lessened degree of

In Wauxhall Park, London
By George E. Brown
(See notes on the illustrations)

Market Women Returning Home

exposure may still be too long for sharpness, but, before dealing with it, I would insist with some emphasis on the fact that a great many—the majority—of one's subjects are of a kind that do not call for a high speed of shutter. Look through past numbers of THE PHOTO-MINIATURE, at the illustrated photographic and other periodicals, and you will find that the photographs which are most pleasing as pictures are not those which are evidently the result of a quick shutter. Races, cyclists, railway trains, all kinds of sporting subjects, such as baseball, hunting, polo, tennis, diving, etc., represent the occasions on which a rapid shutter is a *sine qua non*. It is for all these that the speed of the ordinary cheap diaphragm shutter is "way down" too low for the job. The focal-plane shutter, with its facility of giving speeds from 1-100 second up into the small fraction, or the special "Multi-Speed" pattern of between-lens shutter, has to be used. From this the beginner is led to infer that, because the focal-plane is equal to the high-speed work, it is therefore better than the diaphragm shutter for slower subjects. That is an absolute fallacy, for this reason: The focal-plane, except by special setting, is not a shutter with which one can usually give a slower exposure than 1-10 or 1-15 second. For slower than this, it has to be set to "time," and setting it to "time" is often quite a business, quite long enough and troublesome enough to negative the advantage of the provision. In the case of the diaphragm shutter it is these long "instantaneous" exposures (save the mark) which often make the difference between success and failure. So long as one can hold the camera steady, they are perfectly practicable—for subjects, of course, in which there is no rapid movement. Let not the reader think that, because he has not the high range of speeds of the costly camera which perchance he covets, he is therefore under a disability. On the contrary, he probably has a shutter with the useful speeds.

Exposures for Moving Objects

In THE PHOTO-MINIATURE No. 105, we have dealt briefly with the shutter speeds which are necessary for various moving subjects. The important thing to keep in mind (because it is at the bottom of practical

instantaneous photography) is that the exposure must be shortened in proportion to the speed with which, not the object, but the image of the object, moves. The same thing, the reader says. No, quite a different thing, and for three reasons: (1) The farther off the object is, the longer it takes for its image to travel over a given distance of the sensitive plate. (2) The shorter the focus of the lens, the smaller the image of the object, and again the smaller the real movement on the plate. (3) The more nearly the object is moving to the camera in a straight line, that is along the axis of the lens, the smaller the shift of the image on the plate. If it is moving directly toward the camera, the image alters in size only, scarcely at all in position on the plate, and therefore one can give a much longer exposure than when the object is moving across the space before the camera. These are the three principles on which one judges the exposure necessary. It means that moving objects in the far distance can be practically neglected unless they are moving very swiftly across the subject: and even then, unless contrasting very strongly with the surroundings, the movement will not amount to anything. The bigger the image looks in the finder, the faster must the shutter be set. At such distances as 8 to 12 yards, it is necessary that the moving subject should be secured advancing dead on to the camera, or at a very slight angle to the axis of the lens, in order to get it sharp. To have it moving straight across the line passing through the lens is only to make certain of a blurred picture. To give a rough idea of the range of movement which is possible for the user of a moderate-priced outfit, I would say, that he may consider a vehicle moving at the speed which is possible for it in a busy town to be as rapid-moving a subject as can be attempted with reasonable certainty of success, and this, when it is at least 6 or 8 yards from a camera fitted with a 5-inch lens.

Other Subjects

So far as the manipulation is concerned, success with the hand-camera does not consist in special provisions for every different subject. Practice the judgment of distance and of the speed of shutter necessary for a moving object, and you have in these two factors the secret of

making successful pictures of all kinds of subjects. The rest is largely a matter of choosing a suitable viewpoint, of making the best selection in the finder, and of taking care that the sun does not shine directly into the lens nor fall directly behind the camera. In "A First Book of Outdoor Photography" (THE PHOTO-MINIATURE, No. 80), the considerations which should, however, guide the worker in photographing special subjects are dealt with in detail.

Photographing from Steamers, Trains

On board a steamer making a river or coasting trip the best position is about amidship, where the pitch of the vessel is least. Even so, the camera should not be laid on any rail or part of the ship, but held in the hand, and the shutter worked usually at the top speed. As in photographing a moving object from a fixed standpoint, a sharp picture depends largely on the direction of movement (in this case, of the camera itself) relatively to the axis of the lens. If the camera is pointed at right angles to the direction of movement, the shortest exposures are called for, so that, whenever possible, the picture should be taken pointing forward or backward in the direction of the vessel. The same thing holds good when photographing from trains; but here, owing to the high rate of speed, only general views, such as a valley, town or bay, can be considered possible, and the exposure should be not longer than about 1-50 of a second. When making exposures from electric cars and other street vehicles, a still higher speed—1-150 to 1-200—is necessary, on account of the vibration in the vehicle itself.

The Hand-Camera on a Stand

This monograph, having in view chiefly the amateur photographer who is not prepared to spend seventy or eighty dollars on an outfit of the lordly reflector pattern, I want to impress upon the intending purchaser of a moderate-priced camera the advantage to himself of pocketing his pride, and, at the risk perhaps of being chaffed, including a light tripod stand when out with a camera. I have tried to make it clear that exact focusing by judgment of the distance is an operation in which the best of us go wrong at times. There-

fore, when it is possible, why not actually make sure with one's eyes that the picture is sharp on the plate? The hand-camera worker, too, who has not a lens of the largest aperture, will find that at times the slowest speed of his shutter does not give him a long enough exposure, and here a time exposure solves the problem. When making exposures in interiors of buildings, he will, in any case, need a support for the camera, either one which he takes with him or one which with good luck he may be able to extemporize. In all these conditions, a light stand to which the camera can be quickly attached is a real help. Speaking now as regards cameras which are not larger than 4 x 5, I would recommend one with a ball, or universal head, on which the instrument can be quickly set level or tilted as required, without all the bother of altering the position or length of the legs. Such ball-heads are sold in several patterns at the price of about one to one and a half dollars. A light tripod, of wood or metal, weighs very little and travels in a sling-case over one's shoulder, so that when the camera is being used in the hand, the case is not by any means an embarrassment. Naturally, the tripod is of more direct service to the user of a plate camera than when roll-film is employed, for the reason that, in the former case, the picture can be seen on the focusing screen between each exposure, but still the power of making certain of focus is given even with the film camera simply by stopping down and giving a corresponding exposure. For portraits, too, and all subjects which are much closer to the camera than four yards, the use of a tripod gives a much greater certainty to the exposures and is well worth while.

Plate and Development

You cannot have a plate too rapid for hand-camera work. I make this statement in the face of people who write of the greater ease of working a medium-speed plate, or one somewhat slower than the fastest to be bought. But, in practice, that extra difficulty is not really a matter of moment, whilst it is often of importance to get all the speed one can in the plate. The speed is no drawback when it is not required, since a smaller stop or a quicker shutter exposure puts matters right with ad-

vantage to the result. The beginner who starts photographing under the most favorable condition — bright summer light and open subject—will find things made all the easier to him by an ultra-fast plate. It means that he can stop down his lens to a corresponding extent, and in doing that the difficulties of judging the distance for focusing largely disappear. I advise him to use an exposure-meter; not necessarily every time, but that he may have a fair idea of the strength of light. A meter will thus enable him to secure a rough but sufficient guide for practice somewhat in such form as this: With the full aperture of lens, say *f* 8, in light which darkens the meter tint in ten seconds, with ultra plates on an average subject, say, figures eight yards from the camera, the shutter speed marked 1-100 gives a really fully exposed negative. Then from that working basis he can depart, as the meter indicates, giving twice the exposure (using the same shutter speed with lens at *f* 6) when the meter paper takes twenty seconds to come to the tint. As we have already pointed out in our earlier paragraph, and more fully in THE PHOTO-MINIATURE, No. 105, on "Exposure," the meter tells us what is a really full exposure, and can be used to indicate how far this can be reduced whilst still securing good results. This depends on the plate, but, in general, if a meter says a tenth of a second is the full exposure, a twentieth will still give a result nearly as good, and a fiftieth a quite passable negative.

Development does not call for any advice other than that given in earlier numbers, such as those "Photography with Films" (No. 89), and on "Tank and Time Development" (No. 84). Every one has his favorite method of development, and that will give him the best results on his prized hand-camera exposures. But I may give one or two hints. I would advise the addition of a grooved development tank to the dark-room outfit. Use it when dealing with exposures which are known beforehand to be under-timed, or are seen to be so from their tardy appearance in the ordinary developer. Fill the tank with a very weak solution of a quick-acting developer, e.g., Rodinal, ¼ ounce; water, 50 ounces. Look to it that the temperature is not below 65° Fahr.,

and let things take their course, examining the results every ten minutes or so. In this way you will get better results than by forcing development in the usual stronger solution so often advised.

Development in Numbers

Thanks to the simple apparatus of the Eastman Company, the user of roll-film or film-packs can get through development quickly and, working on the "time" system, can secure a remarkably good average of results. Time or tank development likewise enables us to deal with a batch of plates rapidly and in small space, advantages of the tank method which are equally positive even when the density of negatives is judged by inspection, instead of obtained by development for a stated time. A method which the writer has found very satisfactory in its results when dealing with a big batch of plates, as well as expeditious, is as follows: Put a dozen or so plates into a (empty) grooved tank and pour in weak (1:100) rodinal. If this solution is douched vigorously into the tank, the force will dislodge air bells from the plates, where a gentler stream would leave them on the film. In this developer the plates come up slowly, an image, in case of normal exposure, appearing in three or four minutes. From the look of the plates at this stage, one can tell if they had best be let remain in the weak bath (this should be done if image is slow in appearing or comes up "hard" in appearance), or if they should be taken out and finished off in a normal developer. This should be done, simply to save time, provided the image is seen to show average contrast; whilst, if it looks flat and over-exposed, it should be put at once into the stronger developer and development continued for much longer than would usually be done. A couple of tanks, each holding twelve plates with a dish in which say four plates can be treated with the strong developer, allow of this system of development being worked at the rate of about thirty plates in the hour, and that without hurrying at any stage. The strong developer may be any convenient formula, but preferably one which gives density fairly quickly, and does not stain, e.g., pyro-soda with plenty of sulphite, eikonogen, or metol-hydroquinone. GEORGE E. BROWN.

NOTES ON THE ILLUSTRATIONS

Perhaps I can usefully bring home to the user of a hand-camera some of the essentials in obtaining good photographs by making a few notes on the actual methods employed in producing the photographs reproduced in this issue.

SCULPTURE AT FOUNTAINEBLEAU PALACE

This was a case where one felt the value of a hand-camera on a stand. The head of our amiable friend on the pedestal was some twelve or fifteen feet from the ground, and called for all the rise of front with which the camera was fitted. Without focusing it actually on the ground glass, it would have been difficult to make sure of getting the subject properly on the plate, whilst, with the front thus raised, focusing, too, is not quite so certain a matter as it is with the lens in the ordinary position. In any case, a subject like this calls for as sharp a focus as possible, and that is a further reason for using the camera on a stand, employing a small stop in the lens and giving a time exposure.

STAPLE INN, LONDON, ENGLAND

This was taken with the camera in the hand, but the front was very fully raised and the placing on the plate judged from the experience of the finder. This is a kind of subject where one wants as slow an exposure as possible, since the light in a courtyard surrounded by buildings is never very strong, and this particular corner of London, especially in the summer, contains very heavy shadows. In this case the lens was used at *f* 6, and the slowest exposure of the shutter, 1-10 of a second, was given.

THE FRIEND OF THE FAMILY

Here we have an instance of securing a subject for which one can arrange in advance. The pig and his driver were seen approaching in the distance, the focus was set on a bit of foreground about five yards from the

camera (which is a fair distance for a couple of figures such as these). Then one waited until the pair reached this spot, when the exposure—about 1-30 of a second—was given.

ON THE WAY TO THE FESTIVAL

The subject in this case being a considerable distance from the camera,—this was necessary to get the different planes into focus at the same time,—the focus was set at twelve yards and an exposure of 1-30 of a second given. Notice that the camera was fronted almost directly behind the nearer figures. By taking this precaution, blurring due to movement is avoided. Though the figures in the van of the procession are moving more across the axis of the lens, yet they are obtained sharp, owing to the greater distance from the camera.

IN THE PIG MARKET

This subject and the next one are good examples of the kind of snapshot which can be obtained at fairly close quarters by carrying the camera with the focus set, on, say, four to six yards, and keeping the instrument itself out of observation until almost the instant of exposure. Sauntering round and sizing up the bearings of the subject, the camera is quickly brought into position, a look taken into the finder and the exposure made. Such a near subject, even in sunlight, can do with plenty of exposure, from 1-10 to 1-20 of a second.

STRIKING A BARGAIN

Taken under the same conditions as the previous photograph of the pigs and the little boys, but somewhat nearer the subject, the focus set at four yards. Here, again, one wants to give the slowest exposure the shutter allows.

IN WAUXHALL PARK, BRUSSELS

In this the chief difficulty was to get the different planes all reasonably sharp and, therefore, a smaller stop was used, in this case *f* 8. Owing to the dark shadows in the foreground, as slow as possible an ex-

posure is needed. This had 1-10 second. Subjects of this class afford a good example of the need of a shutter which can be worked at 1-10, or even slower.

MARKET WOMEN RETURNING HOME

This was taken under precisely the conditions of the two figures titled "A Market Basket." The subject was arranged in the finder, the focus set at about five yards, and the exposure given when the three figures had arrived at this point. The photograph shows that a low shutter speed—about 1-25 of a second—is a really useful one when working under such somewhat shaded surroundings as this roadway surrounded by town walls.

In all cases, except "Wauxhall Park" the lens was used at *f* 6. For all ultra-rapid plates were employed.

BOOKS

Hand-camera Photography. By Walter Kilbey. 121pp, illustrated. Paper, 50 cents.

The Hand-camera. By Wastell and Bayley. 204pp, illustrated. Cloth, 50 cents.

Film Photography. (THE PHOTO-MINIATURE, No. 89.) Illustrated. 25 cents.

Advanced Hand-camera Photography. By Walter Kilbey. 98pp, illustrated. Paper, 50 cents.

Photographing Outdoor Sports. (THE PHOTO-MINIATURE, No. 91.) Illustrated. 25 cents.

Photography with Small Cameras. (THE PHOTO-MINIATURE, No. 97.) Illustrated. 25 cents.

Reflex Cameras. (THE PHOTO-MINIATURE, No. 99.) Illustrated. 25 cents.

Focal-plane Photography. (THE PHOTO-MINIATURE, No. 77.) Illustrated. 25 cents.

Outdoor Photography. (THE PHOTO-MINIATURE, No. 80.) Illustrated. 25 cents.

Notes and Comment

The Title Page and Index for THE PHOTO-MINIATURE, Volume VIII (Nos. 85 to 96 inclusive), is now ready for delivery, and will be mailed to any reader on request accompanied by a 2-cent stamp. Those who bind their copies of THE PHOTO-MINIATURE will find this index a great convenience for quick reference to the contents of the volume. As the edition is limited, early application for copies is urged.

Those who can appreciate a good story, with plenty of vim and pluck in it, should send a post-card to the Defender Photo Supply Co., Rochester, N. Y., mentioning THE PHOTO-MINIATURE, and asking for a copy of "A Fighter of Conditions," the story of a three years' war against elemental odds, by Carl Thomas.

We are glad to note that the popularity of the Burroughs, Wellcome Photographic Tabloids and Specialties has so far overtaxed the facilities of Messrs. Burroughs, Wellcome & Co.'s old quarters on Lafayette street, New York, that they have been obliged to move to 35, 37 and 39 West 33d street (near Fifth avenue), to secure larger accommodation for their growing business. The new offices and exhibition rooms are beautifully equipped and will repay a visit.

The first of the 1910 camera catalogues to appear is that of the Seneca Camera Mfg. Co., Rochester, N. Y., and any reader who is thinking about a new hand-camera should get a copy and give it careful perusal. Seneca cameras have many exclusive features of distinctive merit not obtainable in other cameras; they are offered

in a variety sufficiently wide to meet all tastes and requirements and are attractively priced. Send a postcard to Dept. N. Seneca Camera Mfg. Co., Rochester, N. Y., and ask for the 1910 catalogue.

Lenses come and go, as far as popular favor is concerned, but the popularity of the Gray Wide Angles seems to be as constant as the tides. We have used a Gray Wide Angle Stigmat for years with increasing satisfaction, and would not exchange it for its weight in gold when there is "wide angle" work to be done. A recent circular tells us that the popularity of this series has made possible a substantial reduction in prices. A word to the wise is sufficient. Get the new price-list from Gray-Lloyd Co., Ridgewood, New Jersey.

Among the new hand-cameras of 1910, special mention should be given to the Junior Reflex, just put out by the Reflex Camera Co., Newark, N. J. It is admitted that no camera is at once so certain in operation and so sure in efficiency as the reflex type, but the necessarily high cost of production has put instruments of this class beyond the reach of many. The Junior Reflex sells at $12, for pictures 3¼ x 4¼, plates or film pack, and has the reputation of a firm famous for good workmanship behind it. The special features are the unusually brilliant illumination of the image on the ground glass and the practical certainty that twelve exposures will mean twelve pictures. It is a marvel at the price, and we expect that the Junior Reflex will be the most popular of this year's low-priced hand-cameras.

The reorganization of the Multi-Speed Shutter Co., and its removal to new quarters at 161 West 24th street, New York, gives this firm a new lease of life, and the Multi-Speed Shutter is to be energetically pushed this summer. The peculiar blade action of the Multi-Speed, which acts as if the lens were diaphragmed while really working at full aperture, gives the work done by this

shutter marked depth and softness, features very desirable in high-speed work. Those who contemplate high-speed work this year should investigate the claims made for the Multi-Speed. A new introduction coming from this Company is the Novo Tank, which permits of the development of plates by the horizontal method recently demonstrated in Germany. This method is fully explained in the leaflet, which the manufacturers will gladly send on request.

The Obrig Camera Co., 147 Fulton street, New York, advise us that they have the following "out of print" numbers of THE PHOTO-MINIATURE in stock and offer them at 50 cents each, postpaid: Nos. 13, 18, 21, 23, 27, 33, 37, 39, 48, 57, 68, 69, 70, 53, 20, 62, 59. Those who lack copies of these issues to complete sets should apply to the Obrig Camera Co. without delay.

The manufacturers' phrase "a marvel of compactness" fairly describes the new Sylvar Camera introduced by G. Gennert, New York and Chicago. The Sylvar Camera must be seen to be appreciated, but its specifications will indicate its efficiency. In size the camera is only one inch larger than the plate used, and it weighs under 32 ounces. It is fitted with the Sylvar anastigmat, Compound shutter working up to 1-250 second, combination reversible finder and level; rack-and-pinion movement and double extension bellows for long-focus work. The camera is obtainable for pictures 3¼ x 5½ and 3¼ x 4¼, and is intended for use with plates or filmpack.

In the last issue of "Portrait," the clever little magazine sent out by Ansco Company, Binghamton, N. Y., we find the following formula for an Ortol developer for Professional Cyko, which will doubtless be welcomed by those who object to metol. Water, 40 ounces; ortol, 30 grains; sodium sulphite, ½ ounce; hydroquinone, 45 grains; sodium carbonate; ½ ounce. To this solu-

tion add five or six drops of a saturated solution of potassium bromide for blue-black or cold black tones, also for prints intended for sepia re-development. For warm black tones increase the amount of bromide according to the warmth of tone desired; the warmer the tone the greater the amount of bromide required.

The Telephoto Quarterly, No. 9, comes to our desk, full of crisp and interesting information for those who have telephoto lenses or attachments. Captain Owen Wheeler is to be congratulated on his pluck in keeping "T-Q" going in spite of the limited field of workers to whom it appeals. The new number is decidedly the best yet. Among its illustrations there is a clever bit of mountain telephotography, "The Pic de Bassia," taken by J. R. Hutchinson from Pau, at a distance of 65 miles, which surely constitutes a record for long distance photography. The picture is remarkable for its detail and clearness. Every one interested in the possibilities of the telephotography (and these possibilities are wider than most people imagine) should subscribe for "The Telephoto Quarterly." The subscription price is 75 cents per year, and the American Agents are Tennant & Ward, 122 East 25th Street, New York.

Despite the lack of enterprise evinced by the fact that no American manufacturer of backgrounds is wise enough to appreciate the power of advertising in the photographic press, we cannot forbear a notice of the new illustrated catalogue of the Edgewater Series of Backgrounds, put out by the Chicago Photo Scenic Co., Chicago. The Edgewater Series offers a wide variety of designs and sizes for all purposes at reasonable prices, and we recommend our professional readers to see the new catalogue.

During April a series of camera pictures by Alvin Langdon Coburn and Baron de Meyer occupied the walls of the Goupil Gallery, Regent Street, London. The ex-

hibition was, we learn, well attended and abundantly evidenced the genius of these two famous pictorialists.

ODE TO A COOKE LENS

Lines addressed to an old "Cooke" Lens sold some six years ago by a reader of the "Amateur Photographer," England, and only recently repurchased by him.

Canst tell me why, old lens with glasses bright,
I yielded to insidious pretenses
Of others of thy race? For though such lenses
Full covered every inch of my emulsion,
Yet fool was I to compass thy expulsion
And send thee to the distant "ewigkeit."
Ah, Taylor, Taylor! It was *not* the voice
Of Hobson's choice.

Ah, for a space, 'tis true, the glass of Jena
Around me wove its mystic, potent spell
Which led me on to barterings—to sell
Thy trusty form to unknown, alien hands;
And lo, thou wentest forth to far-off lands,
And left me but to sing a plaintive *scena*,
Lamenting my sad loss; ah, think of that,
Anastigmat!

But now again my willing fingers close
Around thine unpretentious "Unicum;"
Again I gaze in admiration dumb
Upon thy shining, highly lacquered hood.
My joy, I ween, can well be understood,
And who will grudge the thought that paltry prose
Is quite inadequate to tell my glee
On meeting thee?

Any reader desiring the other three verses of this tribute of an old admirer can get them on request addressed to the Taylor-Hobson Co., St. James Building, New York, whose new booklet, "Help to Photographers," offers much useful information concerning the later series of Cooke Lenses and how to use them to good advantage.

The many friends of Mr. J. O. Jarrell, for some years past associated with the Bausch & Lamb Optical

Co., Rochester, N. Y., will be interested to know that he has recently associated himself with the Topley Co., Ottawa, Canada, well known as the leading photographic house of that city. Mr. Jarrell is widely known in the trade, and we join our good wishes for his success to those of his associates.

In answer to several correspondents we would advise that all materials and tools for the oil and bromoil printing processes exploited in the last issue of THE PHOTO-MINIATURE, can be obtained from Griffins, Kingsway, London W. C., England, the pioneers of these methods and the first to prepare for the market the special materials they require.

A clever little exposure shutter, with speeds from 1 second to 1-300 of a second (fast enough for average high speed work), is the Optimo, made by the Wollensak Optical Co., 285 Central avenue, Rochester, N. Y., and fitted to the Velostigmat Lens also manufactured by them. The combination of Velostigmat and Optimo is a strong one and the camera equipped with them is fitted for every contingency liable to be encountered in the hand-camerist's day. Send for a copy of "The Photographic Quartet" and learn what four prominent photographers think of the Velostigmat and Optimo combination.

A useful novelty in enlarging apparatus is Lande's Enlarging Lamp, introduced by George Murphy, Inc., New York. This lamp has proved immensely popular in Great Britian and has abundantly proved its worth. It converts any camera into an enlarging lantern without the use of condensers and takes any size negative up to 5 x 7.

Since Mr. R. James Wallace took over the direction of the Cramer Research Laboratory, at the Cramer Dry Plate Works, St. Louis, this firm has introduced a series

of color filters meeting every requirement of photographers for ortho and color work, the special needs of process engravers and kindred fields. Send for the color booklets, mentioning THE PHOTO-MINIATURE, and you will secure two or three little volumes full of useful information not obtainable elsewhere.

The Square Deal Bargain List, issued by C. G. Willoughby's Camera House, 814 Broadway, New York, offers as wonderful a collection of camera bargains as we have seen in years. Do not overlook this list if you are thinking of a new hand-camera for this season.

Wishing to collect information as to the procedure of camera clubs throughout the country as to their methods in conducting competitive print exhibitions, Mr. Harry D. Williar, 639 West Baltimore street, Baltimore, Md., asks us to publish the following queries, and will appreciate answers from all secretaries of potographic societies.

1. Does your club usually have an annual print competition or exhibition?

2. What form of prize does your club usually award, if any?

3. If no prizes of any kind are awarded, does the acceptance and hanging of a print comprise the only honor bestowed?

4. How long are prints usually open for public exhibition? or if not opened to the public, please so state and the time prints are usually on private exhibition.

5. Is it customary with your club to have prints judged and honors awarded before being exposed to the public, or are prints exhibited to the public and judged after having been exhibited to the public for a week or more?

6. Does your exhibition fairly represent your active membership, or is it confined to a few only?

The Whistling Boy
By Henry Hall

The Photo-Miniature

A Magazine of Photographic Information

EDITED BY JOHN A. TENNANT

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Six Photographic Printing Processes

Twenty years ago, when photography was not a popular pastime but a mysterious hobby, a photograph could be only one definite thing, namely—a so-called silver or albumen print. At that time the paper print from one's negative could be made only by one particular process and the result of that process was universally recognized as a photograph. It was the semi-shiny print which, in a greater or lesser degree of preservation, survives in the albums of our fathers and grandfathers and—let it be admitted—has no need to be ashamed of itself in comparison with the productions of the present day. True, at that time, endless other processes were constantly coming up and finding favor for a time with the amateur workers of those days, whose chief delight appears to have been in the methods by which a certain result was obtained more than in the result itself. At that time, also, certain of the printing processes with which we are now familiar were in an embryo stage, either of technical perfection or of commercial introduction, but broadly a photograph meant a silver print made on albumenized paper.

Today the conditions are completely different. The albumen process is as good as forgotten. Probably most of the readers of these lines have never known it save through the description given of it and of certain other earlier processes in THE PHOTO-MINIATURE, NO. 21,

now out of print. In place of this one method of producing what are recognized as photographs, there are as least half a dozen perfectly distinct processes, all of them in daily use on an enormous scale in every country of the world, each of them the mainspring of large factories and all at the disposal of the variest tyro with a camera.

Undoubtedly this changed condition of things has been brought about by the adoption of a quite different attitude towards photography. No longer is it a hobby practiced solely for the interest of its technicalities, fascinating as these are. It is the results lying at the door of every possessor of a camera which chiefly prompt the man or woman, boy or girl, to come under the spell of the art which is no longer the tedious, dirty business it was two or three decades ago. This being so, it is no wonder that we have shifted the responsible part of the business on to the shoulders of the manufacturers. These amiable men have willingly acepted the burden, which incidentally they have found exceedingly profitable. We have only ourselves to blame, if, in the pursuit of photography purely as a means of making pictures, we have missed a good deal of the pleasure which our progenitors found in the methods themselves. The present monograph seeks, in a very simple way, to give in a few pages a concise account of the six photographic printing processes which are most generally used today. We must tell the reader just wherein the wide choice among printing methods is of advantage to him in obtaining the best results from his negatives.

The Six Modern Processes

Huge volumes may be written on this subject but we must confine ourselves strictly to the processes which stand available to every one and, let it be said at once, represent all that is best in photography. These processes are six in number—development (gaslight) papers; bromide papers; printing-out papers (collodion and gelatine); self-toning papers; carbon and platinum. This order is not historical but it is chosen because it introduces the processes roughly in the order in which they may be taken up by the reader with the greatest prospect of success. Development papers are, by gen-

eral consent, the easiest of all in manipulation and have the further feature of making the best of negatives which are faulty. Bromide is very similar, with the feature that it allows of enlargements being produced as well as the prints by contact for which development papers are peculiarly fitted. The print-out papers (we will explain these terms in a moment) are popular for their choice tones and rich appearance; self-toning papers are the same thing still further simplified, whilst the last two processes represent the supreme degree of excellence in photographic prints, with the need of greater care and knowledge to secure the best results.

Processes de Luxe

We may rightly call carbon and platinum printing processes de luxe, and for several reasons. First, there sults are as lasting as a photograph can be. Indeed this is not doing justice to them. They rank equally with etchings and mezzotints in their absolute permanence. Further, their quality (if the negative is the best, and that is a big IF) is something beyond that of the other processes at their best, and lastly, particularly in the case of carbon, the variety of result by the one method of manipulation is a distinctive feature. In the matter of the treatment which they require, they likewise occupy places by themselves, and on this account therefore we will consider them afterwards instead of giving them the foremost position which their merits justify.

Development and Print-Out

Let us understand what we mean by these terms. A development paper in the wide sense is one which is exposed to light behind a negative for a short time only, not long enough for the light to produce a visible image. The effect is produced, completely and satisfactorily, but it requires the application of a developer to make it visible or to "form the image" as the text-books would say. The exposure is usually very short, a fraction of a second by daylight, a few seconds to a strong artificial light like incandescent gas, or a minute or two to a weak source of light. Both bromide and development (gaslight) papers are of this kind, but the term "development" by which the latter is known is used by manufacturers in a narrow sense, namely to describe a

paper which is less sensitive than bromide and so can be printed by artificial light and also safely developed by the same kind of light used, for the purpose, in moderation. Print-out papers are those in which the action of the light must be continued until the picture is fully visible in all details, in fact more than this, since the prints are reduced in depth by their subsequent treatment. No development is necessary but the printed-out picture is afterwards toned with the object of improving the color of the print and giving greater permanency. Papers of the self-toning class are simply print-out papers with the chief chemicals for the subsequent treatment incorporated in the coating itself. A much simpler bath can then be used for the after-treatment, and these papers represent the very simplest form to which photographic printing has been reduced.

Development versus Print-Out

From the practical standpoint the chief difference between the development and print-out paper is that the latter requires daylight. There is no print-out paper which can be worked by ordinary gas or incandescent electric light. If you have an arc light you can put your printing-frames around that and need nothing better. But in the ordinary way you cannot print in the evenings by the fireside as you can with a development paper. The next distinction is that almost all development papers are intended to give a print of black tone and are at their best when giving prints of this kind. The print-out papers are intended for results of warm, purplish color and are at *their* best when so used. There are certain development papers (see later) which give warm colors directly on development, and prints on all these papers can be toned to brown, sepia and other colors—but broadly the beginner should learn that if he is out for warm-toned purplish prints, then print-out paper or the self-toning variety of it should be his choice. If he prefers black prints, or bluish, or slightly warm shades, then he will choose a development paper, the results on which he can, if he so wishes, tone to a number of different colors as fully directed in THE PHOTO-MINIATURE NO. 103, "Toning Bromide and Gaslight Prints."

There are one or two other important distinctions:—Development papers lend themselves more readily to turning out a number of prints all exactly alike, because once the correct exposure has been found, it can be repeated exactly for each print, whilst development is also likewise practically automatic. But with print-out papers, the proper depth to which to print has to be judged in each case whilst toning also requires more judgment to secure uniformity than does development. It is also quicker to turn out a number of prints by a development process than on material which has to be printed out. Further as regards the keeping qualities of both the unexposed paper and the finished prints, the advantage again is with the development paper. Print-out paper contains silver salts which are more readily acted on than those in the development emulsion. Hence the print-out paper spoils sooner. To those who purchase their supplies in the country of manufacture this is absolutely of no account, but it is of importance to those living in hot countries where the photographic materials are imported. As regards the permanence of the prints, perhaps the fairest way to state the difference is this: that both when made under the best conditions are equally permanent, but that a development paper will stand more wrong treatment without prejudice to the lasting quality of the results than will a print-out paper-gelatine or collodion.

Varieties of Print-out Paper

Having thus cleared our minds as to the broad distinctions between the two classes of paper, let us enquire a little closer. Print-out papers are of different kinds. The chief difference lies in the substance or medium in which the sensitive silver salts are held. This is either gelatine (as in ordinary dry plates or films) or collodion. The latter is quite different in its properties from gelatine. It does not soften in warm water as does gelatine; it is more porous than gelatine; and these differences are exhibited by the two classes of print-out papers. Those made with gelatine are usually termed print-out paper (in Britain, P. O. P.) by the makers. Those made with collodion as the vehicle, collodio-chloride (C. C.) or by well-known trade names, such as

"Aristo." Both gelatine and collodion are used as the basis of self-toning papers, but in many cases manufacturers do not say which has been employed. It is not difficult to tell the difference. A gelatine paper when wetted and then pressed, say, with the finger, is found to be sticky. If put in warm or hot water, the film will melt altogether. A collodion print retains the firm character of its surface under these circumstances. This means that in warm weather gelatine prints soften in the baths and need to be treated with preventive solutions such as alum or formalin. It means also that a gelatine print can be given a high gloss by squeegeeing it down to a plate of glass or enameled iron and stripping it off when dry. Collodion prints do not lend themselves to glazing in this way but require another method. The stripping process just mentioned applies of course to any gelatine print, development and bromide as well as print-out.

Other Differences

In addition to this mechanical difference of surface collodion, print-out papers differ in equally marked ways from those made with gelatine emulsion. Collodion papers are better adapted for giving all shades of color from cold black to red, chiefly by means of platinum toning baths. Gelatine print-out papers, on the other hand, are not well adapted for toning with platinum (which with them produces results far from permanent) but they tone well in the so-called combined bath (toning and fixing at the same time) and they are also amenable to a sort of development, by which a faintly printed picture is brought to full vigor in a developer. This latter is not one made up in the ordinary way with alkali such as soda carbonate: the hydroquinone or metol (the two best developers) is used in an acid solution. Neither the combined bath nor this special kind of development succeeds well as a rule with collodion papers.

Development Papers

There are not the same separate and considerable distinctions between the two different kinds of development paper as between gelatine and collodion print-out processes. Both "bromide" and "gaslight" are gelatine papers—there are no development papers prepared with collodion—and both are treated in practically the same way, save

that in the case of bromide, exposure is very short and development must be done by yellow light and usually for at least two or three minutes. With gaslight papers, a greater exposure is needed : development may be done in any weak light and is usually complete in a few seconds. As a rule, the gaslight paper gives more contrasty prints than bromide and is, therefore, chosen for poor and flat negatives, but this difference does not apply to all brands, since many makers produce "soft-working" gaslight papers (for soft prints) and "hard-working" bromide papers (for contrasty prints). Still the beginner may take it as a fairly safe guide that with the normal (not the "special") variety of a maker's gaslight or slow-development paper he will get the utmost contrast or pluck which can be obtained in any print from a negative.

Platinum Printing

In every respect the platinum process is distinct from both the development and print-out methods. It does not answer to either of these descriptions for it is printed until the picture is seen semi-visibly. But its difference is more deep-seated than this. The papers we have been considering are all what is known as emulsion-coated, that is, the sensitive silver salts are made into a kind of semi-fluid milk, which is applied by machinery to the paper and sets as a solid sensitive coating on the surface. Not so with the platinum paper. The natural paper carries the sensitive salts in its fibers, not on the surface only, and the sensitizing mixture is one, not of silver, but of iron and platinum salts. The iron salts are sensitive, and, after the exposure to light under the negative, the platinum salt comes into play : the semi-visible iron salt is caused to form a black or brown deposit of platinum metal, producing the rich hue of one color or the other familiar in platinum prints. This action of the iron salt (reduced by light) upon the platinum salt in the paper takes place in "development": the "developer" in the platinum process is simply a mixture which brings the two into solution together where they can act on each other. In other words, it dissolves out part of the iron salts in the paper, and this process is completed by several baths of

acid which are spoken of as "fixing" the prints, although their action is really similar to that of the "developer."

Distinctiveness of Platinum It will be seen that the platinum process is radically different in its method from "development" or print-out papers: it is equally so in its results. First, the prints are on the natural uncoated surface of the paper and, therefore, are without the tendency to curl which emulsion prints show in consequence of the contraction of the coating they carry. For this reason, a platinum print is the best of all for mounting by the multiple method, where the print has to be attached by a touch of paste at two corners only (see THE PHOTO-MINIATURE, No. 102, "Trimming, Mounting and Framing"). Second, the color, a fine rich black or a warm sepia, is fixed by the paper, though it can be modified by additions to the developer. Third, platinum is the quickest of all day-light processes in giving a print finished and dry. Development is a matter of a minute or two, fixing occupies 10 or 15 minutes, washing a quarter of an hour, after which the print can be pressed between blotters and dried by heat, so that within half an hour it is ready to hand, and this without scamping any part of the process. Fourth, is the absolute permanence of the prints—absolute, that is, in the case of all black prints, and absolute, too, in the case of sepia prints when these are properly made.

The Other Side For these advantages you must pay in several ways: First, in the price of paper; platinum is about three times the price of other papers. Second, in providing a reasonably good negative; platinum will not make a good job of the wretched negatives out of which a development paper will extract something passable, but on the other hand, it does not now call for the extra-vigorous negatives required by platinum papers years ago and still mentioned in the text-books as absolutely necessary for good results. Third, you must give extra care to keeping the paper before, during and after printing perfectly dry. It must be stored in a tube supplied with an absorbent of water and extra means must also be taken to keeping both the negative and the paper dry

whilst in the printing-frame. Most beginners form a quite wrong impression of the difficulty of the platinum process. Actually it is the easiest process to master and work, once the necessary attention is paid to its susceptibility to damp and so long as the negatives have the requisite quality. Judgment of the correct depth of printing on platinum papers calls for no more practice than when using print-out papers.

The Carbon Process

Our second *de luxe* printing process is again utterly different from any other in principle and practice. Carbon tissue is the material which one purchases. It consists of paper coated with a mixture of gelatine and black or colored pigment. As bought, it is not sensitive to light at all and has to be rendered so by means of a solution of a bichromate salt. The tissue as purchased does not look the sort of thing with which to produce the beautiful carbon prints. It is a white paper uniformly coated with a dark mixture of pigment and gelatine. After sensitizing and drying it is printed behind the negative by daylight, but as no trace of the action of the light can be seen, special means (of which later) have to be taken for correct exposure. The method of "developing" the picture is equally distinct. It is first necessary to transfer the coating to a fresh piece of paper so as to bring the bottom surface to the top before placing the print in the developer which, in the carbon process, is nothing more than hot water. Let us ask the reader to think out for a moment the reason for this topsy-turvey treatment. The action of the light on the tissue is to render the gelatine insoluble in hot water. It is the pigment held fast by this insoluble gelatine that forms the picture.

The light which passes through the clear shadows of the negatives causes the deepest deposit of insoluble gelatine: the half-tones, a shallower deposit: the opaque sky, the merest surface film of insoluble gelatine. Therefore, over the whole top surface of the tissue and extending downwards to a greater or less extent, is a skin of insoluble gelatine. The parts of the tissue which have remained soluble are thus sandwiched between this top skin and the paper support, and in

order to dissolve them out we must be able to get at them; in short, we must lay bare the bottom surface. The printed tissue is, therefore, soaked in *cold* water and put face down on a sheet of paper coated with gelatine partly hardened (the so-called "transfer paper"). The two gelatine surfaces adhere in a few minutes and on the whole being treated with hot water the soluble coating, left at the bottom of the tissue, softens. This allows of the original paper support being pulled off, leaving the gelatine coating on the transfer paper with all its soluble parts unprotected. The hot water speedily dissolves these out, leaving the picture (formed by the insoluble gelatine and pigment) visible in all its light and shade and sticking to the transfer paper.

The essential feature of the carbon process is the production of a picture in pigment. That pigment may be of any color, and so a whole series of prints made with the one kind of tissue are necessarily a perfect match in color. Also the permanency of the pictures is precisely that of the pigments used in making the tissues, and as makers have plenty of stable pigments to select from there is no doubt as to the lasting qualities of carbon prints. The range of choice among commercial tissues is enormous and includes many most pleasing and delicate colors, but even when one sticks to one color of tissue the final effect can be varied—and this is a unique and most valuable feature of the process—by employing transfer papers of various tints with which to back up the pigment picture. Thus a print taken on a warm black tissue can be transferred to a paper of cream tint and a toned effect thus secured without any departure from the working method or taking fresh tissue into stock.

Drawbacks of Carbon

Owing to the transference of the printed tissue to its second support, the final picture obtained is reversed as regards right and left, appearing as it would when viewed in a mirror. In many cases, that is an objection, but it can be avoided in several ways, viz.: by printing from the reverse side of a *film* negative, by making a reversed *glass* negative, or by a special form of the process itself. In this the printed tissue is brought on to a

"temporary support" for development and then re-transferred to a final support on which it is laid as when first printed from the negative. A second drawback is the necessity of sensitizing and drying the tissue oneself. These operations have now been greatly simplified by the introduction of quick-drying spirit sensitizers, which, as directed in a later paragraph, are the best for the amateur worker. Exposure of the tissue and the transfer operations sound formidable on paper, but present no real difficulty which need deter even the most unexperienced worker from taking up carbon printing. If he will exercise care and follow instructions precisely, he will succeed in this process after a very little practice, and even if he shirks them there is yet a modern form of carbon printing which relieves him largely even of these anxieties, viz.: ozobrome.

Ozobrome

Ozobrome is carbon *minus* the necessity of sensitizing tissue, *minus* fumbling after exposure with an actinometer, and *minus* also the drawback of a reversed picture. The royal road to these felicities is a good print on any bromide paper. This is simply brought into contact with a piece of carbon tissue soaked in "Ozobrome solution," left there for a few minutes in dark or light (it is immaterial), when behold the bromide picture in the presence of the chemicals of the ozobrome solution impresses upon the carbon tissue just the action which the light exerts when printing on sensitized tissue under a negative in the daylight. You can take your choice exactly how you finish off the process. You can keep the carbon picture on top of the bromide impression, using *it* as a sort of transfer paper, or you can take it off the bromide print in cold water and lay it down to a piece of transfer paper on which it is developed in the regulation way. The development in hot water is the same, and really in ozobrome, which has been called "evening carbon," that is the only operation which may be said to recall the fact that the process is related to carbon at all.

Adaptability to Ends

So much for our brief description of what the processes are and what they will accomplish. We are now in a fit state of mind to learn something more precise as to the

methods of using them for the results to *which they are best fitted*. And forgive me, good reader, if I insist on the italicised phrase. I read of people who seem never so pleased as when by some feat of diabolical cunning they contrive to secure results by processes which were never intended to produce them. They tell you how they secured such and such a tone by printing a development paper right out instead of treating it in a developer, as Providence and the Eastman Kodak Company have ordained that it should be treated. They gloat over a picture made by developing a print-out paper or obtained by toning the most untonable platinum print. I do not doubt the success of these feats of ledgerdemain, but it is a chance remote that the instructions for them will prove serviceable once in ten attempts. Certain products are made with a direct view to their being used in a certain way, and if you go out of that way and try at sore pains to get something which you could get straight away by another method, what can help you? No, this monograph is only worth reading in that it provides help along the line of least resistance. I assume that you have the makers' instructions for the use of their product—bromide, Velox, Aristo, platinotype or whatever it is. My object will be to put forward those points on which makers' instructions are often silent, not from design but from lack of space, hints which are independent of a particular material but apply to the process as a process.

Development (Gaslight) Papers

In the case of every maker's development papers, some are produced with a view to giving their best results from negatives of average good quality and vigor. These papers, usually designated "special," differ from ordinary "gaslight" in being usually more rapid, and therefore require somewhat greater care as to the light in which they are handled and developed. They are something between gaslight papers proper and the bromide papers which *must* be treated in a safe yellow light. Thus, the first thing we want to realize is the light which we can call safe for the handling of an ordinary or "special" gaslight paper. Well, whether it be day or artificial light, it must not be direct from the

Dogwood Blossoms
By Harry D. Williar

A November Morning—Edinburgh
By A. W. Walburn

sky or from the source of light. If daylight, we will draw down the linen blinds, if the windows are fitted with such, or set Venetian blinds with the slats only a little open, and then work a good way, say 8 to 10 feet, back from the window. If we want to work nearer the window, what we must do is to put up a screen of card-board or a framed picture—any opaque screen about 20 x 40 inches—and handle our paper with this between us and the window so that actually we are working with the light reflected from the back part of the room. If using ordinary artificial light such as incandescent gas or electric, we use a similar screen. Place it a few feet from the light and keep papers and developing dish thus shielded from direct rays. Another thing, recollect that safety is only relative. It is a matter of time how long papers may be left in this shadow-light before they are fogged by it. Therefore they should not be left lying about exposed, under the (mistaken) idea that they will not come to any harm. For convenience in taking pieces one by one for exposure, it is best to place the whole contents of a packet in a box with a hinged lid and so save the repeated handling of the wrappings in which the makers send out their papers.

Exposure

As regards exposure, we can equally take our choice of daylight and artificial sources—the difference is mainly one of time. With most papers bright sunshine will be unmanageably fast; it is not possible to be quick enough in putting the printing-frame out and back again. Diffused or quite dull daylight, or the light which falls on the wall of a room opposite a window in bright weather, is usable, but if it is found that the time has to be less than five seconds it is better to do without daylight, to work by gas or electric light in a semi-darkened room, and so be able to give exposures which are long enough to be repeated with certainty. With gaslight papers you have to find out by trial (development) what is the right exposure for the negative. Obviously if, having found that time, it is so short that you can't make sure of repeating it accurately, you can't expect to produce even results. With artificial light, you should adhere to a fixed distance between the light and the printing-

frame, say 5 to 8 inches for negatives up to 5 x 7 size. Better, to make a fixture both of the light and of some mark on the wall, or some actual support or holder of the frame so that you can be certain that the negative is always at this same distance. And the frame must be "square" to the light; not one part nearer than another unless that nearer part is of extra density and you want to take this means of getting more light action upon it. As to the time of exposure, it is impossible to give more than a rough figure, say from 20 seconds to 2 minutes according to the density of the negative and using a 32 candlepower lamp or full-size incandescent gas-burner.

Development The developing operation requires to be perfectly automatic. No use to think of tinkering with the developer in order to make good a mistake of exposure or inferior quality in the negative. For the former you must expose a fresh sheet of paper and for the latter, supposing that the best has been gotten out of the paper being employed, you must choose a brand which gives harder or softer results as the case may be. But as regards development, that should be the same for every print. You will not be long in finding that it must be so, since with many papers development is complete in from five to ten seconds. Gaslight papers are not intended to survive the variations in developer which can be practised with impunity in the case of bromide papers. Similarly, gaslight papers should not first be wetted in water before flowing on the developer; the latter should be poured directly over them or mopped over with a small sponge or tuft of cotton wool.

The Developer There is no need here to give a formula for making up the developing solution. Use the one recommended by the makers of the paper or one or other of the many packet or tablet developing preparations. Assuming that this is in readiness, you require also some 10 per cent solution of potassium bromide. This is best contained in a glass-stoppered bottle, so that by first pulling the stopper a little way out and then pushing it in again you can deliver the solution a drop at a time with certainty. The developer, as made up from the chemicals or as

purchased and simply dissolved, may be all right as far as it is possible to make it, but it may still require a little more bromide in order to bring it into the best working condition. Whether it does require this addition or not depends on the particular paper and on the temperature of the developing solution. The warmer the developer the more bromide needed to ensure bright unveiled prints. The quantity of bromide to be added is very small as a rule. One drop in four ounces of developer will make a perceptible difference in action. Hence the need of caution and of a bottle from which the bromide can be added drop by drop. If too much be used in the developer, the color of the prints is impaired: the prints are greenish black instead of a neutral or bluish black color.

Testing Exposure and Development

When starting to make prints, time and trouble are saved by giving a series of exposures to a piece of paper exposed under the first negative. A printing-frame provided with a set of shutters (an article of commerce in Britain) allows of this being readily done. Another way is to lay between the negative and the paper a screen built up of a few thicknesses of oiled paper so that part of the negative is covered by one thickness, part by two, part by three and part by four thicknesses. That is to say, the screen is built up thus:

3 thicknesses	2 thicknesses	1 thickness
6	3	1½

Such a screen is a very useful means of finding the exposure for gaslight prints from any negative, but it is necessary first to find out how many times one, two or three thicknesses prolong the exposure needed without a screen at all. This can be easily discovered once and for all and the numbers marked on the respective sections of the screen. Then, when trying a new negative, all that is necessary is to give an exposure (with the

screen between print and negative) several times what is judged to be the correct time without any screen and develop the print. One section will come out as a perfect print—not too light or dark and of bright clean high-lights. Then divide the time you have actually exposed in this trial by the number printed from the screen on to this test section of the negative and the result is the exposure to be given in the ordinary way—with of course, the same light and distance therefrom. Though it is a little troublesome to prepare the test screen, this method is one which saves a great deal of time. In Britain one maker (Messrs. Griffin) send out with each packet of their ("Noctona") gaslight paper a numbered test screen for the purpose.

Then, as we have just said, too, correct exposure is not everything: the developer must be right too. The maker's formula or a trade developer *may* give a perfect print with the correctly exposed print, or part of a print which has received several exposures. Probably the result *will* be good. Any defect (due to developer) will be in the way of flatness or want of brilliancy, or even positive fog over the picture. This arises from the developer not being restrained enough. Hence bromide is needed. Add one drop of bromide (10 per cent solution) per four ounces of developer and expose another print. It will probably be enough. It is best to use as little as can be done with, because over-much bromide impairs the color of the print, giving a greenish tinge to the good black or blue-black. Bromide is wonderfully active in its action on paper which is in good condition. If paper has spoilt by long keeping in a damp place, even bromide in the developer will not help matters much. The best plan with such paper is to dry it thoroughly by laying it out in a quite warm box over a stove or actually spreading the sheets before a closed combustion stove or before an open fire grate so long as the fire is not "bright." This will often restore spoilt paper to its original condition, although I cannot personally vouch for the method.

But the first step in adjusting matters is to give a trial exposure. If the print is too light and yet veiled all over (no pure whites), it is clear that the developer is causing fog and needs restraining whilst the print also

needs more exposure. If the picture comes up too dark, too much exposure has been given. Obviously, in this case, you cannot tell whether the developer is right or not. Expose again and note its action on a print more nearly correctly exposed.

Development Itself

Once these preliminary adjustments have been made on small strips of paper, all is plain sailing. The development of each print should last only a few seconds. Lay the paper on the bottom of the dish—no need to rinse out with water from the previous development—and quickly flow over the solution. The picture comes up in a second or two and is completely developed in a time which, for most papers, is under 30 seconds. We must take what this short development gives us. No use keeping the developer longer on the paper if the picture fails to come up to full depth. Expose another piece of paper for longer. Still more useless to correct over-exposure by stopping development short: the picture will veil over almost at the instant that the image appears. The developed print is removed and rinsed for a second or two in plain water. It must not be let lie in this water or it will further veil or darken. Just a mere rinse and then straight into the fixing bath. This must be of the kind advised by the makers, that is (as a rule), hypo, alum, acetic acid, etc., for American papers: plain hypo, as a rule, for British. The precise strength or formula is not a vital matter, but a paper for which an "acid" fixer is prescribed would probably stain badly if fixed in plain hypo. As regards fixing, two important points: (1) The hypo must not find its way by splashing or finger tips into the developer. (2) Each print must be kept well covered, for a few seconds, by the hypo bath when first immersed. Therefore, it is well to have a flat stick of hard wood in the fixer, and use it to keep each print under the surface. If can also be used to spoon sprints out into the wash water, and thus there is no necessity for either hand to touch the hypo solution except every now and then when prints should all be turned once or twice and separated from each other in the hypo fixing bath.

Uniform Color A very little developer will serve to bring a lot of prints to full vigor, but the first signs of exhaustion must be looked for, not in the liquid failing to give pictures of full depth, but in these latter showing a falling off in color. The fine black or blue-black gives way to an image of brownish shade, and our final hint as to development papers is to guard against this defect by taking a look from time to time at a print (fixed and rinsed) by bright white light—daylight or incandescent gas: in the weak light in which one develops it is less easy to notice the point at which the developer needs replenishing by the addition of fresh solution.

Bromide Printing With this more rapid kind of development paper, a darkroom is a necessity. The paper must be handled and developed by orange or yellow light. The ruby light one uses for plates is not so good. Not that it is unsafe. On the contrary it is not bright enough: it is not so easy to judge of the depth which the picture has reached, for unlike the gaslight paper a bromide does not come at once to its proper strength. Development is more leisurely—two or three minutes—and can be humored either by stopping it sooner, continuing it longer or, to some slight extent, by modifying the developer. But I don't advise the beginner to expect any benefit from playing fast and loose with the developing formula. Better to stick to one or other of those given by the maker and to modify only by adding water. At full strength it will give the strongest and most contrasted prints (give also a shorter exposure and develop fully). On the other hand, by mixing the developer with twice or thrice its bulk of water and giving a full exposure, prints of much softer character will be got. In the one case, the color will be a full black; in the second, gray and paler. I am seeking to make clear the range of power which bromide gives us. This is much greater than gaslight paper. On one brand of paper we can get quite a variety of results from one negative. Thus, different brands of bromide do not differ as do the normal and special gaslights. There is not the occasion for it. Still, there are differences. Some

papers tend to brilliant and hard results; others to soft effects for use with contrasty negatives.

Exposure In the darkroom it is not so easy to tell the coated or sensitive side of bromide paper. The beginner should note that the paper curls with the film side inwards and that to the moistened finger tip one corner of the piece becomes sticky. Another good test is to stand facing the darkroom light and bend the sheet of paper into an arch. The line of light along the top of this arch will show up the emulsion side as perfectly even. The paper side is seen to have the texture of the paper. Matt, rough, glossy and semi-matt papers are seen equally sharply when examined in this way.

Daylight is far too quick in its action to be used for printing on bromide: the artificial lights named for gaslight papers must be used, and the exposures are seconds where gaslight required minutes. In order to save having to cover dishes where prints may be fixing or developing—no white light should reach them until they are in the wash water—it is a good plan to have the light for exposing enclosed in a box, one side (or better the top) of which is formed by the printing-frame. The light in the box can be raised and lowered for the exposure or kept burning all the time and a sliding shutter raised and lowered to uncover and re-cover the negative. A simple form of such a "bromide printer" is readily made out of a good-sized box, whilst a number of patterns are on the market in many of which the mere pressure of the paper against the negative commences the exposure, release of pressure ends it whilst the pressure back also in certain patterns draws away and lets the exposed paper fall into a box without the need of fingering it. A "printer" makes bromide work a very smooth and speedy process, yet it has its drawbacks. The negative is kept practically at a fixed distance of 8 to 14 inches from the light, whereas much benefit accrues to results by exposing weak negatives much further away (3 or 4 feet). In this case the longer exposure is reckoned not in simple proportion to the distance but in proportion to the distance multiplied by itself, that is at 3 times the distance (from light to negative), 9 times the exposure:

at 4 times, 16 times the exposure. For average negatives (not unduly flat) about 2 feet is a convenient distance from light to frame, but in any case, the frame should not be so near that a correct exposure is less than 5 seconds, for reasons already given under gaslight paper.

Development Except with very rough surface papers there is no need to soak the paper in water before development: though no harm in doing so. Lay the paper face up in the developer and pour over it in an even sideway sweep, or, if using plenty of developer, push one end of the print into the solution so that developer advances over it in a straight-fronted wave. Don't pour developer on the middle of a print or shove the latter anyhow into developer without expecting to get uneven pictures. Parts of a print do not all catch up to a fixed depth as with gaslight papers. Take out of the developer while the picture still looks a shade too light; that is, those on matt or rough papers which dry distinctly darker: glossy or semi-glossy bromide does not call for this small precaution. The print is then rinsed for a few seconds under the faucet or in a basin of water. Here again a longer wash will not hurt it (difference from gaslight) but it is usually best to pass it straight on to the fixer which may be either plain hypo (three to four ounces in twenty ounces of water or the acid fixer used for "gaslights"). Fixing must be thorough, and as one cannot tell with any certainty from the appearance of the prints the best course is to allow a full 10 minutes: to give prints an occasional turn round (that is bring them in from the bottom to the top) and finally to avoid using the same lot of fixing solution for more than one or two batches of prints.

Common Mistakes The most common is over-developing, getting prints with clogged-up shadows. This often arises from working in the ruby semi-darkness of a small lamp as used for negative plates. A big lamp giving plenty of yellow light is not difficult to make out of a box and some yellow fabric or paper. Another mistake is letting white light fall on prints whilst in the fixer, or, in the desire to see what a picture is like, taking it out of the

hypo-bath and holding it up to the light half fixed. This leads to veiling of the pure whites in the print. A nasty greenish color of print comes from under-exposing and forcing development. A rusty hue results from over-exposing and seeking to correct the error by adding bromide to the developer. Prints which are thus "off color" can be remedied by the chromium method given in THE PHOTO-MINIATURE NO. 103, p. 321, but as a rule the best remedy is—make another. Flatness or hardness must be put down in general to the negative but remember that for hard negatives print close to the light and use weak developer (3 to 4 parts water); for flat negatives, print 4 or 5 times normal distance from light and develop with full strength solution. For wretchedly flat negatives the reader is advised to use a gaslight paper.

Toning Developed Prints

The many excellent methods of producing sepia, brown, red and other tones in gaslight and bromide prints are beyond the scope of this monograph, particularly as they have so recently been made the subject of THE PHOTO-MINIATURE NO. 103, to which the reader must turn for full working instructions.

Collodion (Print-out) Paper

C. C. or collodio chloride is quite distinct from gelatine print-out paper (P. O. P. as it is called in Britain); both print-out but C. C. requires quite distinct treatment and is specially adapted for different effects, namely fine warm and warm-black tones. What may be called the standard method of toning C. C. paper is that in which it is first treated in a gold bath and then in one of platinum. The process yields the finest black and warm-black tones. The shorter the toning in the gold, the warmer being the final tone. This method is universally used by professional workers but calls for considerable skill and practice in getting a series of prints all equally of the tone required. For this double-bath toning every maker of C. C. paper issues instructions which are all that can be desired for precise detail, and therefore in this monograph we shall deal with toning methods which yield exquisite results, are simpler, but are not generally brought into promi-

nence by makers as is the double-bath method, chiefly for the reason that the professional photographer (whose sheet-anchor this latter method is) is the maker's first care. While directing notice to these alternative methods, we would have the reader understand that the standard double-bath method is still the one capable of giving the very finest results on C. C. paper.

Stock Toning Solutions For toning all print-out papers the essential chemicals are gold chloride and the platinum salt sold as potass chloroplatinite. Both of these are naturally expensive and must be used with care to avoid waste. They are purchased in small glass tubes containing in each case, 15 grains of the precious salt. The best plan is to dissolve the whole contents of the tube (without weighing) in two ounces of distilled water contained in a glass-stoppered bottle. Two ounces equaling 15 drams very nearly, it is exact enough to reckon that each dram of the solution contains one grain of salt, so that in all formulas where so many grains of gold or platinum are directed we measure out drams of the stock solution. To make the solution, soak the tube in warm water to get off the paper label, after which place the tube in a clean glass graduate and pour over it one ounce of distilled water. Now with a smart tap with a clean glass rod or small pestle, break the tube and let the crystals dissolve, which they speedily do. Pour the solution into its bottle and rinse the graduate out with two successive half-ounces of distilled water, pouring each into the bottle so as to obtain all the gold. Then put aside (*in the dark*) for use. The only difference in making up the gold and platinum is that for the latter one drop of strong pure hydrochloric acid is first added to the water in the graduate. Unless this is done, it sometimes happens that the platinum does not dissolve to a quite clear solution or becomes turbid after a time. The reader will understand that in referring further to stock gold or platinum solution we refer to those made as above.

Printing and Toning C. C. paper has a delicate, because porous, surface, and requires more care to avoid touching it with moist fingers than gelatine print-out paper or development emulsions.

Like other print-out papers it can be handled in any light short of that of outdoors in bright weather. You should come indoors to examine the progress of printing and place the table for toning, etc., where it will not be in a strong light. The depth to which printing must be carried depends on the toning bath to be used, but all require at least an appreciable over-printing—beyond the depth which the finished prints is to be. Prints can be kept for a day or two before toning, but they are far better for being treated on the day of making.

Washing before Toning For almost every toning process the prints require first to be washed in 4 or 5 changes of water, until on adding a little of the wash-water to a few drops of common salt solution contained in a glass measure no milkiness is seen. This means that the soluble silver salts in the paper have been dissolved out. With some papers—with all, to some extent—there is a tendency for the prints to curl up and prove awkward to manipulate. There is an easy way to avoid this practically completely. When first placing the prints into the wash water, put only enough water into the dish to cover the latter to the depth of a quarter of an inch or so. Then place in the prints face down one after the other, pressing the second on the first and so on, so that all are smoothed out from the start by being kept flat against each other. Bring out singly from the bottom as soon as all are in, when it will be usually found that prints lie quite flat in the succeeding waters which, it need hardly be said, should fill the dishes to the depth of an inch or more.

Brown to Warm Black Tones For these the platinum bath only is used. It is made up as follows:—platinum stock solution, 2 ounces: phosphoric acid solution of sp. gr. 1.12, 5 drams, water 10 ounces. This bath is either diluted with a further 20 ozs. of water (to 30 altogether) to form the toning solution, but instead of diluting it all at once in this way, it is better to place about 6 or 8 ounces of water in the toning dish and add of the full strength mixture of platinum and phosphoric acid first 3 or 4 ozs. and then an ounce or so at a time as the prints are passed through and toned. The advantage of this latter

plan is that it keeps the working bath more uniform in strength. In from 5 to 10 minutes each print tones to brown or black color. The longer the time, the colder the tone.

Prints for this bath require to be over-printed to the depth usual for print-out paper, namely until the highest lights are creamed over and the deep shadows commence to show appreciable bronzing.

Washing after Platinum Toning

This is a most important point in all platinum toning of C. C. paper. The platinum bath is acid. If the print, with this acid in it, is carried in to the hypo bath, the result is to decompose the hypo and so form compounds in the print which turn yellow within a very few days of the print being made. Therefore the prints must be passed through several wash-waters before going into the hypo. This means constantly changing them into fresh clean water, giving 6 or 8 short soaks. After each, lift each print separately from its wash water to the next: simply lifting the whole batch in a mass is a perfectly useless system of washing, in fact it is not washing at all. It is well, too, to keep at hand a solution of soda bicarbonate and add a little to the last water in order to make sure of neutralizing any traces of acid which may still remain in the prints.

The fixing bath should be 3 ounces of hypo in 20 ounces of water, and in this prints should fix for 10 or 15 minutes, being frequently turned over the while. The final washing should take the form of a series of 5-minute soaks in repeated lots of clean water, again keeping the prints separated from one another by constantly turning them over. This method of final washing is the best for C.C. as for all kinds of prints, but if the labor of it proves too irksome, then the worker may feel fairly safe in giving four of these hand changes and then putting prints to wash in running water for an hour.

Sepia Tones with Platinum

Wash the prints in three or four changes of luke-warm water and then in three (also luke-warm) to which ammonia .880 has been added in the proportion of 2 drams per 20 ounces. This bath turns the prints a lemon-yellow, after which they are washed in plain cold water

Evening Clouds: Lake Como
By J. Dudley Johnston

Subway Kiosk, New York
By Joseph L. Seiler

(three changes) and toned in the platinum bath already given, being fixed and washed as already directed. Print more deeply than usual for this process.

Red and Purple Tones

Print to the usual depth or a little less and wash in three changes, then immerse in a bath of common salt of strength 1 ounce in 20 ounces water and keep them here until they assume a yellow color. This may take 15 minutes or longer, and prints are rinsed and given a *very short* immersion in a gold bath made as follows: Gold stock solution, 2 drams; borax, 80 grains; water, 25 ounces, or the gold bath formula recommended by the maker of the paper. The great thing is to tone only just long enough to give the red chalk color which will usually mean not many seconds in the bath. Then fix and wash as usual.

For purple tones quite a different gold bath is used: Gold stock solution, 6 drams; hydrochloric acid pure, 3 ounces; water, 10 ounces.

The prints are very deeply over-printed, are washed in three changes of water and toned in this bath, after which, on account of the acid present in such large quantity, they must be thoroughly washed before fixing.

Precautions with C. C.

Collodion prints require perhaps more care after taking out of the wash water than any other form of print. The delicate image is more susceptible to chemical impurities, such as hypo in the blotters in which they are laid to dry, etc. And particularly is it necessary to have them dry quickly both before and after mounting. Neglect of this is one of the most fruitful causes of small yellow spots which make their appearance within a day. The prints should be laid out face up on clean blotters in a warm room if they are dried before mounting. If trimmed wet and mounted forthwith, then the mounts should be spread on a rack where the air can circulate round them freely and so ensure rapidly drying. Once prints have dried, they seem immune to moisture which would prove fatal to them at this last stage of their production. The purest mountant should be used; freshly made starch paste is as good as any other, but any left over at the end of the day is best thrown away.

Gelatine Print-out Paper This popular kind of printing paper, of which Solio is perhaps the best known example, is not so well suited for producing the wide range of tones which are readily obtained on collodion paper. The effect it produces is a characteristic purplish brown or brownish purple, difficult to describe but spoken of as the P. O. P. tone. The negative which gives the best result with print-out paper is one which is somewhat softer than that producing the best results on collodion P. O. P., which means that with one's average negatives a print on gelatine paper will be rather more brilliant than when printing in C. C. Two methods of toning are used. In one the chemicals for the toning, the gold, etc., are combined with the hypo or fixing body so that toning and fixing go on simultaneously. This is the so-called "combined bath," and is the readier and easier system of working, though the results are not quite equal to those by what is called "separate toning," according to which the print is first toned and then fixed. Also the results by this latter method are usually more lasting than those by the combined bath, but this is due more to the abuse of the combined bath than to any inherent defect in the bath itself.

Printing The first thing to learn is the depth to which to print the paper under the negative. This will vary with circumstances, but if the beginner will follow two rules he will not get far wrong after a little practice. Rule No. 1.—The longer a negative takes to print (owing to badness of light or thickness of the negative itself) the less the degree of over-printing which is necessary. Rule No. 2.—Print considerably deeper when toning with the combined bath than when using the separate method.

Printing should not be done in direct sunlight except in the case of very dense hard negatives and then great care should be taken to see that both paper and negative are quite dry before putting in the frame, otherwise they will very likely stick together, or the silver salts in the paper will cause brown stains on the negative (they appear after a time), which are very difficult to remove. In the ordinary way from 10 to 15 minutes

is a fair time for getting off a print. No harm is done however much longer it is, so long as the paper is kept dry—in wet weather by a backing sheet of rubber, water-proof cloth or celluloid but the time should not be much shorter. As with collodion, the sky or other brightest parts of the subject should be seen to have a brownish cream tint and the deep shadows be bronzed and with the detail in them quite blocked up and unrecognizable. Papers vary in the degree of over-printing which they require, and, as we have said, it must be more for the combined bath.

The Combined Bath

I don't blame the beginner if he fights shy of making up the combined bath. I own that the trouble of dissolving half a dozen different chemicals usually drives me to use one or other of the many ready-made "toning and fixing" baths or salts on the market. However, for those who prefer to make their own, the formula most suited to his paper is given by almost every maker. Whatever the bath, it should not be used so strong that a print comes to the tone required in less than six or seven minutes. For the reason that it is unlikely that the fixing part of the process will be complete in less time than this; and, therefore, one of two things should be done: either add water to the bath so as to reduce its speed of action (usually an equal bulk of water) or pass on the prints into a bath of hypo, 3 ounces in 20 ounces water, in which the fixation will be completed. Prints should not remain too long in this extra bath—only for a time which, with that in the toning bath, will make 10 to 15 minutes altogether. This is the first way in which the bath may be abused—using it too strong. The second is continuing to treat prints in it after its real toning powers are exhausted. Unfortunately the bath does not give an invariable sign of exhaustion by refusing to tone: even when the active gold is all gone it continues to exert a certain toning action, the results of which cannot be depended upon to last. The safe course is to take enough of the bath to tone a given number of prints and to throw it away after use. Makers of toning preparations usually give an idea of the quantity of paper which the bath will properly tone, and, in the case

of combined baths made up from a formula, a rough and ready rule is to use a bath containing two grains of gold chloride for not more than 12 or 15 5 x 7 prints, or a proportionate number of larger or smaller.

The prints are put dry into the bath, that is without previous washing, and are kept on the move until toned. Then give the extra fixing if necessary, and finally wash as already directed for C. C. prints. It is the simplest and a very satisfactory method of toning gelatine print-out paper.

Separate Toning and Fixing The best bath for the characteristic bluish purple tone of P. O. P. is that made with gold and ammonium sulphocyanide. The latter is a crystalline salt which absorbs water greedily and soon spoils unless kept perfectly dry. But in a fairly strong solution it keeps fairly well and, therefore, 1 ounce should be dissolved in water and the whole bulk made up to 9 ounces. Every 10 minims of this stock solution contains 1 grain, and the toning bath can be compounded on this basis. In making up the bath, care is chiefly needed in the order of mixing and manner of adding the gold to the sulphocyanide. Thus, if we are making up 20 ounces of toning bath of average strength, the best way is to put 10 ounces of water in a 20-ounce measure, add to it 300 minims sulphocyanide stock solution (=30 grains). In another measure place 2½ drams of gold stock solution as made up for C. C. paper (=2½ grains gold) and add about 8 ounces of water to it. Now add the diluted gold solution to the sulphocyanide, about an ounce at a time, stirring well at each addition so as to disperse at once the red color which appears in the solution at each addition of the gold. If *cold* water be used in each case the bath must be left for twelve hours (made over night) to ripen, but if the water be *scalding hot* the bath is ready for use as soon as it has cooled to normal temperature.

The prints must be carefully washed in changes of water before toning (see Collodion paper). To secure a uniform tone throughout a batch of prints, the best plan is to allot so much bath to a given number, put all in together and remove each when it attains the desired tone. If you dribble the prints, a few at a time, into

the bath you are constantly weakening the solution and except after much practice you will never get an even tone throughout a series of prints. The Eastman Company in their instructions for Solio give the proportions of bath to take for toning on this system, which is an admirable one to follow with any paper. The toning process must be done in subdued daylight, say at a window with newspaper tacked up over the lower half and the blind drawn down to cover the top edge of it. The point at which to stop toning is judged with most papers by looking through the print while the latter is held up to the light. There should be no trace of redness in the shadows, and this result should be secured in from 5 to 10 minutes. If it is found that a bath usually tones too quickly, a *very little* sulphite of soda may be added when making it up. One grain is enough for 20 ounces. Dissolve 20 grains of sulphite in 20 ounces of water and add 1 ounce of this solution (which must be made fresh on the day it is used) immediately before commencing to tone. This gives a slower bath and one less liable to what is known as "double toning," that is a blue tone in the high-lights and half-tones, whilst the heavier shadows are still reddish or warm-colored in tone.

Washing after Toning

Most important, here, to wash thoroughly and to prevent any trace of hypo coming near the prints. The makers will tell you to keep one dish religiously for toning; I would add that it is almost as necessary to do the same in the case of the dish in which prints are washed at this stage. Traces of hypo exuding from cracks in the porcelain will give rise to pinkish stains, which make their appearance in the fixing bath. I would advise a glass dish for this after-washing and making it chemically clean with commercial hydrochloric acid followed by copious flushing in clean water. Half a dozen changes of clean water will make the prints ready for fixing, the bath for which should be:—hypo, 2 to 3 ounces (not more) in water 20 ounces with no other addition whatever. The acid fixing baths must not be used with print-out papers. Ten to fifteen minutes in the fixer, keeping the prints moving occasionally, ends

the process, save only for the final wash, which is done as already directed for C. C. paper.

Warm Tones on P. O. P.

The sooner prints are removed from the toning bath, the warmer the color, but even so, the sulphocyanide bath is not very suitable for producing warm-tone results. A better bath for this purpose is that made up with borax, or acetate or tungstate of soda. These, though excellent for this latter purpose, will not yield the purplish tone of sulphocyanide. Candidly, for nice warm tones, it is best to use self-toning paper, which is *par excellence* the easiest method, but if you would use ordinary P. O. P., a suitable formula for the toning is as follows: Sodium tungstate, 30 grains; sodium carbonate cryst., 1 grain; gold chloride stock solution, 1 dram (=1 grain); water, 20 ounces.

Rapid Brush Toning

I ought to mention a further method of toning prints, because it is one which beginners get on with excellently at once, although it is a rather extravagant system. A very small quantity of a very strong toning bath is applied to the print with a brush in quantity sufficient to tone that one print and no more. Toning takes place in less than two minutes, the prints cannot be overdone as the bath is exhausted. As a rule, I think the tone produced is superior to that got either in the combined or separate baths. Prepare solutions as follows: *A*. Ammonium sulphocyanide, 1 oz. water to 9 ozs. *B*. Soda phosphate in same proportions as *A*. *C*. Borax, saturated solution, that is pour 6 ozs. of hot water over 1 oz. borax and allow to cool. *D* is our stock solution of gold chloride. To prepare the toning bath, mix in the order here given:—*A*, 70 minims: water, to make 5 dram: *D*, 1 dram (added little by little): then *B*, 30 minims and *C*, 80 minims. The quantity of this mixture to use per 5 x 7 print is about 1 dram. Put this quantity in a half-ounce graduate, and absorb it on to a good-sized, soft camel's hair mop brush mounted in horn, not metal, and well washed in cold water and shaken nearly dry. Lay the dry print on a clean glass plate and go over it quickly with even strokes of the brush. Toning will be complete in less than two minutes, during

which time keep the brush moving evenly over the print. Then rinse in clean water and place in the fixer. Not a quick process when one has a number of prints to deal with, but most useful where there are only a few to be finished off. It is a real boon to be able to make up the toner from stock solutions which keep and to be certain that the bath is just as it should be.

Developing P.O.P.

In dull weather the use of either form of print-out paper, collodion or gelatine, may be a lengthy business if the negatives are at all dense, and thus there came into use some years ago a development process which may be useful at times with gelatine paper; it is not practicable with C. C. There is less call for it now that slow development papers are available, but when for some reason warm-toned prints of the full detail, which is perhaps unexcelled by a print-out paper, are required, it is a most useful method. The paper is used in the ordinary way save that it is handled when keeping it and loading the frames with about the same care necessary in the case of gaslight. It is printed only faintly, say, until the shadows of the subject are visible. The precise depth is not a great matter. The deeper the printing is carried the warmer the tone of the developed picture, and the less noticeable the slight increase in contrasts which this method produces in comparison with printing fully out. The developer consists of a solution of pyro, metal or hydroquinone in conjunction with an acid such as acetic or citric. It is best to keep the developer in a stock solution and dilute as required. Stock solution :— Pyro, 60 grains; metol, 60 grains; acetic acid, 1½ drams; water, 6 ozs.

To prepare the working developer, half an ounce of the stock solution is mixed with 15 ounces of water at the time of use. This diluted bath is best thrown away when as much of it as required has been used. There are one or two rules which must be observed in the process. The dish in which the print is developed should be scrupulously clean: best of glass, previously cleansed with strong acid. The developer should not be kept in use after it shows signs of becoming muddy. This will usually be after it has developed a couple of

prints. Developer is cheap, and therefore it is a good rule to use fresh for each print, say, half an ounce for the 5 x 7 size. Lay the print face up in the dish, flow over the bath evenly and carefully watch the image gaining strength. Over-develop only a shade and then without rinsing transfer print immediately into a fixer containing hypo, two ounces; sulphite of soda, one-half ounce in water, 20 ounces. Leave the print to fix here for ten minutes and meanwile go on with developing others. The colors obtained by this process will vary with the make of the paper and the degree of printing and range from reddish sepia to brown with a greenish shade in it. Often the tone is not agreeable but can be improved by passing prints through a combined bath instead of into the hypo, or if preferred the combined bath can be used after the prints have been fixed. The process will not satisfy those who look for really excellent tones, nor is it easy to turn out a lot of prints all alike as regards tone. But for getting off a number of prints at small expense—for example, when making a register of ones negatives—it is an excellent and most useful method.

Drying and Glazing Prints

When the prints come from the wash water—and what we say here applies equally to gaslight and development prints—they can be allowed to dry with their natural surface or given a high gloss by squeegeeing them down on to glass or ferrotype plate. In the first event one prefers to get them to dry fairly flat, and the best means of doing this is to lay them, gelatine side *down* on thin open-mesh cheesecloth or net stretched evenly in a frame. Dried in this fashion, they will lie reasonably flat until taken off the muslin and put away between cards or in a book to await mounting. It is less trouble in the end, of course, to trim prints before toning and to mount them straight from the wash-water. The easy method of mounting gelatine and other prints in numbers is described in THE PHOTO-MINIATURE No. 102 on "Trimming, Mounting and Framing"

The alternative plan of finishing off gelatine prints (on glossy paper) with an extra-high glaze has the advantage that the prints dry in contact with the glass or

ferrotype plate and thus spotting of the prints by settlement of dust is avoided. To those who have to work in the dust- and smut-laden air of cities this is a real boon and often the only way of securing spotless results. To make certain of the prints coming away readily from the glass when dry, the glass (or ferrotype) must be perfectly cleaned and the prints need to have their surface somewhat hardened. Glass—which gives the higher gloss—is more apt to lead to sticking than ferrotype, but once it has been brought into working order, prints can be depended to strip off from it perfectly. The plate—best of ¼-inch thickness—should be put to pickle in some spirit of salt, rinsed, cleaned with hot soap or soda lye to remove grease. This, on first taking into use. Then when the prints are ready the glasses are wiped perfectly dry and polished either with French chalk or with a solution of beeswax (20 grs.) in turpentine (1 oz.), polishing off the powder or medium in each case with a clean duster. Prints are then laid face down and pressed into contact with a straight or flat squeegee which, used lightly across and across, removes air-bells.

Hardening Prints

Hardening the surface of the prints is done with a bath of formalin (5 drams per 10 ozs. water) or alum (1 oz.) dissolved in 20 ozs. of water. Formalin is the better of the two for the reason that alum, owing to its acid character, is a bad thing to apply to prints which may contain traces of hypo. These latter, harmless in themselves, become dangerous in contact with alum. Use the hardening bath for 5 or 10 minutes, giving the prints a wash of about the same time. Prints which have been allowed to become bone dry before being squeegeed to the glass thereby acquire a hardened surface without any special bath for the purpose, and this is a method which is of service to many who fail to get prints to strip off easily.

As pointed out in THE PHOTO-MINIATURE No. 102, the gloss of the stripped print is partly lost in the mounting, owing to the penetration of the paste. The thick dextrine mounting pastes affect the surface least, but in order to retain the full gloss a good plan is to

let the prints become nearly dry on the glass and then paste down on the back of each a water-proof paper. The two dry together and the print, when stripped off with this backing, can be mounted without loss of surface or, indeed, is stiff enough for use for many purposes without mounting at all.

Self-toning Papers

These papers, which have attained a universal popularity during the past few years, contain the gold in the emulsion. Seltona is representative of this class. They are printed just like any other print-out paper. Toning takes place on the prints being placed either in a plain bath of hypo or, in the case of some papers, first in some other bath (of sulphocyanide, or alum, or both) which is followed by fixing. Self-toning papers are made both with collodion and with gelatine, but there is no question that finer results and real certainty as to what tone one will get, are obtained with the collodion papers. A good deal has been said by way of casting doubt on the permanence of prints on self-toning papers, and that is only natural for a simple reason. Most print-out papers contain a certain quantity of organic acid such as citric or tartaric. When, as is often directed in the instructions, prints on self-toning papers are placed direct without washing in plain hypo solution, the acid from the paper is very liable to cause (with the hypo) a species of toning which is not real gold toning and is not lasting. Therefore a good way of comparing the merits of two self-toning papers is to see how the prints tone if they are washed for 10 or 15 minutes before placing in the hypo or if some soda bi-carbonate, say ¼ ounce per 20 ounces, be added to the fixer so as to neutralize the acid from the paper as fast as it arrives. A paper which tones just as well under either of these conditions is better than one which has its toning powers by the washing or the bicarbonate reduced. Obviously a paper which does not require a separate bath before the hypo is less efficient than one which can dispense with it, and as a matter of fact, the best and most popular self-toning papers are those (collodion) which give a rich brown or sepia tone on simple fixing in hypo containing a little bi-carbonate. With these papers the only other solution

required is one of salt, in which prints are treated for five minutes or so before being fixed. This produces a purple tone, which is obtained of darker and bluer shade by increasing the strength of the salt solution or leaving the prints longer in it.

One great merit of self-toning papers is the evenness of tone obtainable throughout a series of prints. This is a natural result of the gold being supplied by the print; one cannot very well tone with too much or too little as when working with a made-up toning bath. The drawback to self-toning papers is that, as a class, one cannot get warm, black tones on them except by toning them; but they, or rather those prepared with collodion, are most readily toned in this way, yielding results similar to those on C. C. paper by the double-bath toning method.

Platinum Printing

The things to be borne in mind in making platinum prints are quite different in kind from those of importance in silver processes we have so far considered. With platinum we use no developer (in the ordinary sense) and no hypo; there is no toning and no troubles from a medium (collodion or gelatine) in which the sensitive salts of silver papers are held. The enemy-in-chief of the process is damp. The paper is purchased in sealed tins charged with calcium chloride. The pad of this moisture-absorbing body in each tube will suffice to keep the paper dry for a day or two if the lid of the tin be sealed after use with a strip of adhesive cloth or rubber band, but for regular work a couple of storage tubes, one for paper and one for prints should be got and the maker's tins thrown away as soon as opened. Equally, negative and printing-frame must be dry and the paper kept dry while printing by a backing sheet of rubber, water-proof cloth or celluloid. Equally, too, the print must not become damp in the time which elapses before "development." In a proper tube it may be kept for days or even weeks but usually (and advisedly) one develops the same day.

In printing a faint grayish image appears on the deep yellow platinum paper. The printing is continued until the detail in the highest lights of the subject are just

faintly discernible in the print. With some little practice this print is judged quite correctly: the remaining part of the process, unlike silver print-out papers, calls for scarcely any exercise of judgment.

Development is done with a solution of potash oxalate, which may be made faintly acid by addition of a little saturated solution of oxalic acid, but must on no account be alkaline. Oxalate is sometimes impure in this way and must be corrected or better, discarded, as it is probably of bad quality altogether. The developer is used at a temperature not under 60°. It may be made tepid (up to 100° Fahr.) for prints which have been undertimed in printing, but the color is then warmer. Prints are brought into contact with the surface of the developer by placing one end with one hand over (not in) the solution and with the other hand lowering the prints in a low shape on to the liquid. The picture appears almost instantaneously. Raise it for a moment from the developer to see if the latter has completely covered it (no air-bells), and if not, just run a clean glass rod over the surface. Then float it on the developer for a few seconds longer and place in No. 1 of a series of three acid so-called "fixing" baths each prepared by diluting pure hydrochloric acid with water in the proportion of ½ oz. acid to 30 ozs. water. Prints are allowed to accumulate in the No. 1 bath until all are developed, when each is transposed singly to No. 2, all left there 5 minutes, after which a further 5-minute sojourn is made in Bath No. 3 which is kept in use as long as it remains water-white. As soon as it shows the faintest yellow tinge it is promoted to the position of No. 2, No. 2 made No. 1 and a new lot of fixer poured out for use as No. 3. These baths render soluble the iron salts on the paper and remove a large proportion of them. The last washing—for a quarter of an hour—is to remove the acid, the last traces of acid going in the process. The prints are then ready to dry.

The developer can be used repeatedly if kept shielded from strong light. It requires renewal by fresh from time to time, and a good automatic method of keeping it constantly strengthened is to make up a given quantity

for use, to mark the level of the solution on the bottle, and after each use to add fresh developer from a separate stock to keep the liquid at this level. The time during which the print remains *on* the developer—once all the detail is out—is immaterial, but no object is served in keeping a faint print longer or in immersing it. The only thing is warm the solution. In the fixing baths, also, longer soaking does no harm to the image, but the acid renders the *paper* very tender, and, even with a 15 minutes' allowance for the three baths, care is needed in handling the prints to avoid tearing them. In these baths too much drawing of prints one over the other is apt to damage the picture by actually rubbing away part of the paper. There is no occasion to keep prints constantly on the move.

Sepia Platinum Everything which has been said above applies equally to the papers specially prepared for making sepia prints. This color can be got with the ordinary paper by using a developer containing mercury. A good formula (Inston's) is to mix the ordinary developer with an equal bulk of:—Potass citrate, 150 grains; citric acid, 240 grains; mercuric chloride, 90 grains; water, 14 ounces, using the mixture slightly warm and following with three acid baths not stronger than one part acid in 200 parts water. But the better plan is to use the special sepia papers, according to the maker's instructions. "Black" and "sepia" papers should not be stored together nor treated in the dishes kept for developing and fixing "black" prints. Throughout, greater care is needed in handling, as sepia paper is more susceptible to damp and sensitive to light.

Semi-glossy (Japine) Prints This later introduction of the Platinotype Company relieves the process from the charge of yielding prints only on matt or rough papers. In the "Japine" paper, made both in "black" and "sepia" the sensitive coating is held in a medium which imparts a semi-glossy surface to the print somewhat resembling that of the now obsolete albumen print. Japine papers are treated very nearly in the same way as the other papers but they develop more slowly and may be given a final bath of weak

glycerine in order to ensure prints lying flat and limp when dry. This glycerine bath, however, is not essential: its use will depend on the degrees of the surroundings in which the prints are finished.

The Carbon Process

The first step in carbon printing is to make the purchased tissue sensitive. For the amateur worker, by far the best method of doing this is with spirit sensitizer such as that of the Autotype Company (George Murphy, Inc.). Tissue need not be sensitized until the morning of the day it is to be printed, and the worker is thus saved the disappointment of preparing material which on the next day from bad weather or other causes cannot be used. The spirit method dispenses with the lengthy drying during which the tissue must be kept in the dark, where it will not come in contact with gas fumes which render it partly insoluble and prevent good pictures being obtained. Emphatically the spirit method, practiced according to the maker's instructions, is the most advisable. After sensitizing, the tissue *can* be kept for several days in a drying box, similar to that used for platinum paper (except that the box should be a species of drawer in which the sheets of sensitive tissue can be kept flat under slight pressure). But there is no necessity to prepare more tissue that can be used at once, as th. material is ready for printing within half an hour of the spirit solution being applied.

The Negative

requires to be one of strong character, hard, even in comparison with the kind which prints well on development or print-out paper. And it must also receive on the glass side what is termed a "safe edge," namely, an edging of opaque paper or narrow brand of black varnish which give a white and vignetted border to the print. This is to prevent the picture washing up and frilling round the edge of the image.

Exposure

There being no visible sign of the action of light on the dark-colored tissue, means must be taken to judge when exposure has been sufficient. For this purpose an "actinometer" is used. It consists of a series of tints of different densities, each numbered 1, 2, 3 and so on

up to, say, 6. Thus the denser tints represent dense negatives and the lower numbers correspond with thinner negatives. This scale is exposed to light alongside the negative from which the carbon print is being printed, but the frame holding the tints is charged with a strip of print-out paper, gelatine or collodion. Some judgment is needed in deciding what number of tint requires to be printed in the actinometer in order to give sufficient time for a negative but, with a little practice, it is easy to size up the actinometer number of a negative by looking at it, and then, no matter how the light varies during printing, all that is needed is to continue printing until the tint of this number in plainly impressed on the strip of paper in the actinometer. As a quite rough guide to exposure, it may be said that carbon tissue needs about the time which would suffice to make a print on print-out paper of the depth which the finished print should have, that is considerably less than is required for print-out paper in actual practice.

Development

As already explained, before the tissue can be developed it has to be turned face-round on another support. The transfer-paper, which is to receive it is, therefore, put to soak in cold water. When it has softened (about 5 or 10 minutes) the exposed tissue is p'aced in the water with it. The tissue first curls up, then straightens itself out again. As soon as it does this, it is brought into contact (under the water) with the transfer paper (the two gelatine surfaces together) and the two removed clinging to each other. They are laid on a piece of hard board or zinc plate, lightly but firmly wiped over with a squeegee and put aside for about a quarter of an hour under light pressure. At the end of this time the surface of the tissue will have adhered firmly to the transfer paper and, on putting the two together in hot water, 90 to 100 degrees Fahr., the soluble tissue will begin to ooze out from between the two papers, and the support of the tissue in the original instance can be stripped off and thrown away. On now letting the freshly supported tissue soak in the hot water, the soluble gelatine dissolves out, carrying pigment with it and leaving on the paper a pigment picture which is absolutely per-

manent and, if the process has been properly done from a suitable negative, as perfect a photographic print as can be made. It is now only necessary to pass the print into an alum bath for a few minutes and then to rinse it for a minute or two, when it is dried and ready for finishing and mounting.

Ozobrome In this most ingenious process the two bugbears of ordinary carbon printing in the eyes of the amateur worker, namely the sensitizing and the printing by actinometer, are removed. From the negative a good bromide print is made and left (or put) to soak in water. A piece of so-called "ozobrome plaster," a rather thinly coated carbon tissue, cut a little larger than the print, is put in a "pigmenting solution" made by diluting the ozobrome solution as sold with four times its bulk of water. Here it is left only for long enough to soften—2 to 2½ minutes. It is then drained, given a dip for from 15 to 20 seconds in a weak bath of hydrochloric acid and then transferred direct into a dish of water where it is placed film to film with the bromide print, the two removed together and firmly squeegeed together (without slipping). They are left in contact and under pressure for 15 to 20 minutes, during which time the "pigment plaster" undergoes just such a change as is caused by exposure under a negative to daylight. At the end of the time it is ready for development, which can be done in two ways:—(1) directly in *hot* water, the tissue adhering to the bromide print which thus forms the support of the final carbon picture and cannot of course be used again. The second method consists in separating the tissue and bromide in *cold* water. The bromide is put aside for use again after redevelopment. The tissue is brought in contact with a sheet of ordinary transfer paper and, after contact under slight pressure, developed just as in the ordinary carbon process already described. The advantage of this is that the picture can be obtained on any support, the original being released.

At Last Our resumé of the current printing methods is done. If it has exceeded the customary length of space and has forced us to withhold certain illustrations and notes intended

for this issue, the reader, it is hoped, will find in it a guide amid the multifarious papers and processes of to-day which will stand him in good stead.

BOOKS

Printing Papers, Described and Compared. (THE PHOTO-MINIATURE, NO. 78.)

"Oil" and Bromoil Printing. (THE PHOTO-MINIATURE, NO. 106.)

Ozobrome, Kallitype Sepia and Blue Prints. (THE PHOTO-MINIATURE, NO. 81.)

Carbon Printing. (THE PHOTO-MINIATURE, NO. 93.)

Development (Gaslight) Papers. (THE PHOTO-MINIATURE, NO. 93.)

Toning Bromide and Gaslight Prints. (THE PHOTO-MINIATURE, NO. 103.)

Platinotype Printing. By A. Horsley Hinton. 50 cents

Carbon Printing. By Max Boelte. 50 cents.

Notes and Comment

The transmission of photographs by telegraph between widely separated points is at last an accomplished fact. During the last month Mr. T. Thorne Baker, of London, installed his tele-photographic apparatus in the office of "The New York American" and successfully demonstrated the practicability of receiving by telegraph a photograph sent from Boston. The reproduction of this photograph, as it appeared in "The New York American," was altogether satisfactory, and the photo-telegraphic method will doubtless hereafter be widely utilized in newspaper illustration. Mr. Baker explained his invention and showed the operation of his apparatus before the New York Electrical Society on the evening of May 11, the demonstration being attended by many workers famous in scientific fields. In a personal interview with Mr. Baker, we learned that his method has been in successful use by the "Daily Mirror," of London, between Paris and London, and Manchester and London, since July, 1909. With some slight modification, on which Mr. Baker is now working, the inventor expects that very shortly he will be able to accomplish the wireless transmission of photographs.

"How and Why in Photography." We have received from Burroughs, Wellcome & Co. (35 West 33rd Street, New York) a very useful little booklet, entitled "How and Why in Photography." It contains two lengthy chapters on exposure and development, with practical tables and many valuable hints. There are also chapters on firelight photography, intensification, photography for tourists, and so on; profusely illustrated. The little book will be sent post free to all who ask for it and mention THE PHOTO-MINIATURE.